RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.

PUBLISHED EVERY FRIDAY BY THE RAILROAD GAZETTE AT 83 FULTON STREET, NEW YORK
BRANCH OFFICES AT 375 OLD COLONY BUILDING, CHICAGO, AND QUEEN ANNE'S CHAMBERS, WESTMINSTER, LONDON

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VOL. XLI., No. 23. FRIDAY, DECEMBER 7, 1906.

A correspondent who has had the advantage of intimate acquaintance with Samuel Spencer's habits of thought and methods of work, discusses in detail his skill as a railroad organizer, his success at once as an operator and as a financier, and his fondness for an honest balance sheet. Apart from these things, testified to by a multitude of witnesses, it seems to us that Mr. Spencer has on two special counts left his impress on American economic history, first in his belief in the South, part of which he was, and second in his often expressed conviction that the best interests of the railroad and of the community were the same, perpetual and inseparable. Prior to Mr. Spencer's death there had been two empire builders in the railroad field, one with his thoughts and energies bent to the new Northwest; the other, to waken the older South from its lethargy, and build up a new South within and around it. Each stood for a sectionalism ardent, but not militant; each wrought miracles for a people slow to appreciate and quick to condemn. The Northwest still has James J. Hill, in the fulness of his works, but where is the South to find another Samuel Spencer?

The delay in moving grain from the Northwest has become so serious and is causing such loss to the farmers, that the Interstate Commerce Commission is going to investigate it. The trouble in the Northwest does not seem to be due directly to congestion at terminals; it is claimed that the elevators at Duluth, Minneapolis, Chicago and other lake ports have plenty of room for wheat, but the railroads are not hauling grain from the storage elevators along their lines. In many places the grain at primary shipping points is being piled on the ground, and because of these conditions some shippers have accused the railroad companies of purposely leaving the grain alone and hauling merchandise, because they are sure to get the grain traffic sooner or later. Some have even gone so far as to charge that there is an agreement between the granger roads not to carry grain until the end of the season of lake navigation, so as to give them the advantage of the long haul east by rail. While perhaps better explanations than this can be made of the congestion in particular districts, it is undoubtedly true that the fundamental reason for the car shortage all over the country is simply that there are not enough cars in existence to take care of the unprecedented traffic. In general, the equipment on hand is being worked to its heaviest capacity. An officer recently said that of 100,000 cars east of Buffalo one-third were moved every day. Yet on some of the best managed roads of the country when the traffic is normal a car on an average is earning money only one hour out of the twenty-four. The Lehigh Valley, the New York Central and the Erie are reported each short about 1,500 cars at Buffalo, where there is the greatest congestion in New York State. In the South, the scarcity of cars for carrying pig iron and coal to foundries has put up the price of the metal over 25 per cent. in certain places. The movement of coal is being hampered not only by the lack of cars, but by the difficulty of getting labor for loading and unloading them and by constant delays to coastwise shipping. In Texas, fire insurance companies recently threatened to cancel the insurance on exposed cotton during transit because of the great amount piled up on station platforms caused by the lack of cars to move it. A recent press despatch from an interior Texas town said that 500 steers were in the pens there, with snow on the ground, although cars had been ordered nearly a month before. It is probable that, in spite of the large number of new cars being delivered every day, the car shortage will continue well on into the winter. Just at present the usual movement of merchandise for the holiday trade is exceptionally heavy because of the great prosperity of the country, and this freight is naturally given precedence over low grade freight. Consequently, traffic that is ordinarily cleaned up in the early part of the winter is being held back and the movement of fall traffic seems likely to continue until the slack season gives the roads time to catch up.

The collision at Lawyer, Va., killing the president of the road on which it occurred, brings out an unusual flood of newspaper comments, but so far no new ideas. One of the most rational—though it is marred by some hysterical and ineffective beating of the air—is the editorial of the New York *Evening Post*, which says:

> The tragic death of Samuel Spencer, president of the Southern Railway, in the wreck of Thursday morning, should serve as a terrible warning to the officials of his and other southern railroads. . . . The comparative suddenness with which its prosperity came really swamped his railroad, as it has many others. Not even his practical experience could insure a well run railroad. *Whether this was because of his own limitations, or because he was more absorbed in questions of policy and finance, this is not the time to consider.* The tragic fact remains that his own lamentable death was caused by one of those needless and inexcusable accidents about which the southern press has of late been complaining with deep feeling. . . . Mr. Spencer's death would not have occurred if both the trains wrecked had not been hours behind their schedule. As now explained, the fault lay with the operator of a block signal station, but that not much reliance was placed upon the block operator appears from the fact that a brakeman was hastily sent back to flag the oncoming train. So serious have the delays become that the Georgia Railroad Commission has within a few days asked for more power to enable it to compel the railroads to maintain better schedules. The public, North and South, is fast reaching a state of mind where no amount of prosperity will condone inexcusable delays and needless loss of life. Fully 80 per cent. of the accidents are avoidable—some critics say 95 per cent. . . .

The query which we have italicized suggests two obvious truths, obvious to railroad men though they do not often formulate them in print. We have no special information concerning the Southern Railway or its officers concerning the question here suggested, but looking at large railroads generally we may say that important failures because brilliant men have only 24 hours a day in which to perform their complex duties are very common, and that absorption in questions of finance is only a phase of this condition of things. In other words, the great railroad man's task is far greater than he is. Any one of our strongest presidents will measure ten times the size of the average, let us say; but he undertakes to do twenty, fifty or a hundred times the average president's task. He can do this only by the aid of an army of competent lieutenants, and these he cannot get. He can get a few only. The rest are average men.

Lieutenants fully competent can be had only by beginning five years or more in advance and training them; but this the railroads have not done. A few roads have made commendable progress in this training, but even these have put into the matter but a fraction of the energy and money that will be necessary if perfect and satisfactory railroad science is to be developed. Division superintendents, in some respects the most important officers in the railroad service, usually have twice the work that ought to be put upon them. A hundred superintendents to-day need a hundred bright young men for understudies at $2,500 a year. Because of somebody's "limitations" or absorption in questions of finance these understudies are not hired. They do not seem even to be sought after with any adequate persistency. When we speak of important failures we do not mean complete failures, of course, but failures in important affairs. Take, for example, the question of block signaling on the Southern Railway. How much time have its competent officers been able to give to the questions connected with the introduction of the system? In common with many other roads the Southern was years behind time in adopting it at all. Have these officers decided conclusively, and on impregnable grounds, that they should not have put in automatic signals (or automatic track-circuit control), thus doing away with such operators' errors or neglect as occurred at Rangoon? Or, if automatic signals were not to be used, did they go to the bottom of the question of operators' fallibility, their need of education, training and experience? Railroads everywhere are complaining of the poor quality of operators and the difficulty of finding recruits; must we accept this situation as incurable and interpret it in the only way that it can be interpreted—as meaning that the risk to passengers' lives from collisions is increasing? As already intimated, these questions do not apply to the Southern Railway alone; but the Southern will now be asked by the public to answer them.

Concerning the demand of the Georgia Railroad Commissioners for power to regulate train schedules the Commission is, no doubt, voicing a strong public sentiment, and the *Evening Post* is right in commending this sentiment; but it is a grave question whether the Commission can do any good in this direction, except to clearly set forth the facts, so that the public may know the situation in all its details and judge for itself. The making and management of train schedules is an intricate business that cannot be successfully dealt with at long range. That a railroad should, in the matter of its time-tables, be frank with the public and with itself, is as obvious as that honesty is the best policy in commercial dealings. If, after intelligent and persistent effort, a train cannot be run somewhere near its schedule time, the duty is plain to lengthen the time. An Atlanta paper recently gave a statement, said to have been compiled from the observations of its reporters, and covering a week or two, showing that the Southwestern Limited, the best train of the Southern Railway, arrived in Atlanta, regularly and without exception, from 40 minutes to two hours or more behind time. The average, if we remember correctly, was more than an hour late. The habitual treatment of passengers in this way may be looked upon as the same as delivering shipments of freight habitually in a damaged condition, yet not so seriously damaged as to warrant the consignees in expending time and effort to present and collect a claim for damages. Where this situation exists in the freight service, every freight officer is ashamed of it, and he would correct it if he could. In some respects it is incurable, and the only way of doing the consignee justice is to make his average rates low enough so that he can stand this petty bleeding. In the passenger service, however, the remedy is not so difficult. To run a train slower requires, usually, only the courage to meet the laughs of one's competitors. To put on another train is chiefly a question of accepting less profit on the business. The passenger problem being the easier, the duty of applying the remedy is the clearer, and the helplessness of the aggrieved passenger, in the matter of formulating and collecting his bill for damages, affords an added reason for doing everything possible to prevent the damage from accruing. One of the significant sentences in the *Evening Post's* article is that in which the editor observes that on the Southern Railway "not much reliance is placed on the signals." Unfortunately, this situation exists throughout the United States. How does a railroad manager feel to have his efforts at safety thus brought into contempt? This point was the subject of an article in the *Railroad Gazette* which was written just before the Lawyer collision and which appeared just after it. Another thing said by the *Evening Post* which the editor deems significant, but which is not so, is the implied statement that the fact of both trains being hours behind time was a contributing cause of the collision. How would the *Evening Post* apply this reasoning in the case of the trains on the express tracks in the New York City subway? Or on one of the main lines between Jersey City and Philadelphia, where trains must follow one another very frequently? Do we not want just as high a degree of safety between Lynchburg and Danville as between New York and Philadelphia?

Official statements issued by the two railroad companies, published in another column, show that on the days of the two big football games in the East this fall, there were handled, including travel in both directions, a total of about 76,000 passengers, of which undoubtedly all but a few went on account of the game. It will be remembered that in the *Railroad Gazette* of January 5, 1906, figures were given showing the number of one-way passengers carried during the past six years to the annual big games at New Haven. They showed that at New Haven the Harvard game brings heavier travel than the Princeton and that on the day of the Harvard contest in 1904, 32,529 one-way passengers were carried, bringing in passenger receipts of $53,666 to the New Haven road, a sum which very nearly equaled the daily passenger receipts on the whole New Haven system of over 2,000 miles of line. Unfortunately, the New Haven returns for this year show only the travel in one direction, but if we can judge from the Pennsylvania figures, the outgoing travel is about as large as the incoming, so that on this basis there were over 43,000 one-way passengers carried by the New Haven road this year. The largest previous figure was at the Yale-Harvard game in 1902, when 39,349 one-way passengers were carried. The figures given by both roads are especially interesting as showing the efficiency and promptness with which this heavy rush of travel was handled. In a sense the New Haven had the easier problem, for its heavy traffic was distributed among three different divisions with regular trains bringing in their passengers on three other smaller divisions. On the other hand, passengers were brought into and taken away from a city, while the Pennsylvania's passengers were taken to a country town. More than this, the operation of the New Haven road just east of the New Haven station is now under the handicap of the New Haven cut improvements and the road is still limited for that mile and a half of track to a two-track line. At Princeton, where in previous years there have been serious delays on the three-mile branch running from the main line at Princeton Junction, this has now been double-tracked and three yards built to handle a traffic which in its full volume comes only once in two years, on the day of the Yale game. Three yards were used, one for Philadelphia trains, one for trains to Trenton, Newark and Elizabeth and one for trains to New York. The distance from Jersey City to Princeton is 50 miles and from Philadelphia to Princeton 46 miles. It will be observed from the detailed statements showing the time of departure and arrival of the 58 extra trains run by the Pennsylvania on that day that 10-car trains carrying between 700 and 900 people made each of these runs, including the transfer from the main line to the branch at the rate of more than 40 miles an hour from stop to stop. When it is considered that this traffic is peculiarly difficult to handle on account of the fact that it comes almost entirely within the space of three or four hours, and that the road carried on that day 33,363 passengers, the success shown in handling its traffic can be better appreciated. A run of 50 miles in an hour and 10 or 15 or 20 minutes is not in itself remarkable, but when it is made by one after another 10-car train running at short intervals, it bears witness at once to an admirable roadbed and a high order of operating ability.

THE "OVERCROWDING" OF PASSENGER TRAINS.

The alleged overcrowding of passenger trains on railroad lines of high passenger density and especially at terminals in great cities where passenger traffic is likely to be congested is a question which is always with us. We are able to present below some official figures bearing on the subject. They are taken from the returns of conductors on the New Haven road and refer to traffic on inward and outward trains at New York City for a whole day taken quite at random and which happens to be Thursday, October 11, 1906. Returns for all outward and inward passenger trains, numbering on that date 119, were examined. In general, from two-thirds to three-quarters of the seats in these trains were occupied. Out of the whole number we have selected 22 trains that seem to be of greater or less significance. In the subjoined tabulations they are lettered

from A to V inclusive, and show car by car the seating capacity and the number of passengers on each train.

A.		B.		C.		D.	
No. of pass'grs.	Car capacity.	No. of pass'grs.	Car capacity.	No. of pass'grs.	Car capacity.	No. of pass'grs.	Car capacity.
91	53	78	77	75	77*	74	53*
77	75	72	69	52	75	67	69
74	75	54	69	52	75	70	69
45	69	37	69	35	77	67	69
42	77			31	65	63	77
49	69	241	284				
73	75			245	369	341	337
72	71						
483	564						

E.		F.		G.		H.	
No. of pass'grs.	Car capacity.	No. of pass'grs.	Car capacity.	No. of pass'grs.	Car capacity.	No. of pass'grs.	Car capacity.
61	61	66	61	57	53*	62	75
62	77	71	69	68	73	70	75
69	75	74	75	41	75	93	75*
69	75	60	75	47	75	69	75
50	75	56	75	70	75	67	75
29	75	68	75	63	69	62	66
69	69	74	75	71	69		
68	69					423	441
477	576	469	505	417	489		

I.		J.		K.		L.	
No. of pass'grs.	Car capacity.	No. of pass'grs.	Car capacity.	No. of pass'grs.	Car capacity.	No. of pass'grs.	Car capacity.
71	65	41	41	75	69	62	61*
77	75	68	69	65½	69	74	77
66	69	93	75	67	69	65	69
66	69	75	73	60	69	62	75
25	75						
305	353	277	258	267½	276	263	282

M.		N.		O.		P.	
No. of pass'grs.	Car capacity.	No. of pass'grs.	Car capacity.	No. of pass'grs.	Car capacity.	No. of pass'grs.	Car capacity.
71	75	14	20	51	61*	71	75
58	75	33	40	51	69	76	77*
58	75	30	34	76½	77	63	67
70	75	28	34	70	75	41	61
52	65	33	16			42	75
64	77			248½	282	33	75
72	70	138	144				
64	65					326	430
70	69						
73	69						
652	715						

Q.		R.		S.		T.	
No. of pass'grs.	Car capacity.	No. of pass'grs.	Car capacity.	No. of pass'grs.	Car capacity.	No. of pass'grs.	Car capacity.
60	77	67	75	70	75	55	69
53	69	61	66	70	75	54½	69
66	75	57	75	65	69	66½	69
70	75	60	75	72	73	69	60
90	77	63	77	90	60	75	75
67	69	59	75				
47	77	60	60	367	352	320	342
453	519	427	503				

U.		V.	
No. of pass'grs.	Car capacity.	No. of pass'grs.	Car capacity.
62	67	71	69
64	69	71	75
49	69	71	75
60	75	72	75
64	69	73	77
43	41	69	69
342	390	427	440

*Smoking cars

In the foregoing tabulations smoking cars, so far as they appear in the conductors' sheets, are included and marked by an asterisk, many of the sheets omitting them. Parlor and sleeping cars are not marked and are included, while club and dining cars are excluded, no private cars appearing in the 22 trains. These trains are chosen from the 119 mainly as showing the heaviest train loads of the day in proportion to passenger seating capacity. In the general summary for the 22 maximum trains 7,909 passengers are to be set against a total train capacity of 8,851 passengers, or a little more than 89 per cent. Roughly stated one-tenth of the train —and car—capacity was unused. The average train load for the 22 trains was a little more than 359 passengers, a fact of some side interest in comparison and contrast with the average of 81 passengers per train retained by the New Haven company last year for its whole system in four states.

Analysis in more detail of the returns for the 22 trains brings out a number of points of interest. It will be noted that only three of the trains were overcrowded: Train D had an excess of 4 over capacity, train J had 19 and train S had 15, the total excess thus being 38. The overcrowding of particular cars when there was plenty of room in others is noteworthy in many cases. Thus in the train marked A two cars had more passengers than capacity, while three cars in that train had a total of 79 empty seats. The same feature in greater or less degree may be observed in trains B, D, F, G, H, I, J, K, L, M, Q, S and V; in other words, in all except eight of the 22 trains. The failure of passengers to distribute themselves at all evenly in many of the trains is very striking, a fact probably to be charged up partly to their own unwillingness to hunt up seats, partly to the negligence of the conductor and trainmen. The overcrowding of smoking cars will also be seen in the case of four out of the eight cars of the kind returned, the 93 passengers in the smoker (capacity 75) of train H being conspicuous. But has the passenger who smokes moral or legal right to demand an extra car to seat an overflow usually small and almost always transitory? The smoking car that leaves the big city terminal overcrowded is apt to thin out radically at the first stop.

The instance taken here is that of a road with immense passenger traffic subject to considerable variations, some of which cannot be foreseen. On a typical day operating 119 passenger trains in and out from a metropolitan terminal its overcrowding was represented by 38 passengers on three trains, this on a total volume of daily traffic of not fewer than 30,000 passengers. Such a condition of affairs hardly rises to the dimensions of a great public abuse.

THE SANTA FE BETTERMENT WORK.

We are especially pleased to have the opportunity to present to our readers the review of the shop betterment work on the Atchison, Topeka & Santa Fe Railway System, the second and concluding instalment of which appears this week. Although the work has been in progress for nearly three years, the Santa Fe management wanted to be able to point to results, rather than theories, as material and indisputable evidence of the merit and justification of the undertaking, and until such results had been achieved beyond question, publicity was carefully avoided. It is, therefore, probably safe to say that the greater part of the railroad world has been in ignorance of the very existence of the undertaking, and therefore of the fact that certain important innovations were being incorporated into the practice of a leading railroad system. As pointed out in the article, the time that has thus far been expended in introducing the work, which is only in its beginnings as far as its ultimate scope is concerned, is some rough indication of the difficulties that have attended the efforts to put it into effect, largely because of its radical and revolutionary character. Those in planning and advisory charge had for the most part to blaze their way, with few precedents to guide them, and additional credit attaches to their efforts on that account.

That such an undertaking would be impossible of accomplishment except through the instrumentality of a corps of specialists such as have had charge of the Santa Fe work, is unquestionable. And in this statement there is no reflection on the ability or energy of railroad officers and men in general, or any intimation that they are satisfied to leave conditions as they are. It is simply that for reasons well known, few have the chance, whatever their inclination. The average railroad man is so completely occupied with the numerous pressing duties of the moment incident to the urgent and incessant need of keeping the transportation machine in motion, which require his entire time and attention, that there is no opportunity, no matter how great his desire, for planning and putting into execution radical methods and practices to improve efficiency and effect economies. And this is aside from the fact that special aptitude and training for work of this character is a primary and most important requisite, particularly where it is undertaken on a scale such as that described. New and unexpected conditions and problems which could not possibly have been foreseen are continually arising, and require the careful and intelligent analysis of one skilled in laying bare the essentials of such things, who has before him complete data to enable each question to be viewed from all angles and the probable results of any move to be pretty well known in advance. To do this he must be in possession of all the requisite information and records, so tabulated or graphically prepared as to present the situation plainly and comprehensively. This in itself requires qualifications of a special sort, the result of natural capacity reinforced by thorough training.

A vitally essential feature of such a system of betterment work as that of the Santa Fe is prompt rendering and complete and accurate keeping of records and accounts. This in itself is an important innovation in American railroad practice, the shortcomings and laxness of which have often been compared to commercial industrial concerns to the great disadvantage, if not actual discredit, of the former. And it is gratifying to observe that the progressive railroads are awakening to the possibilities that exist in adapting to their practice industrial ideas which can be utilized profitably, with resulting large economies and improved efficiency. Standardization of equipment, centralization of manufacture of material, and

systematization in the ordering, handling and distribution of supplies have accomplished results which produce substantial gains in the earnings account. The results thus far achieved on the Santa Fe indicate what possibilities still exist for the introduction of vast improvements in almost all departments, which would introduce economies in American railroad practice to a degree hitherto undreamed of.

One feature this work will include, mentioned in one of the outlines, but not referred to in detail in the article, is the adjustment of repair activity to traffic needs. After a period of unusually heavy traffic the power is generally in poor condition, due to the severity of the service and the enforced neglect of any but such running repairs as are necessary to keep it going. At the expiration of such a period an extraordinary number of locomotives are usually dumped into the shop, generally without previous warning, overtaxing facilities, and detaining the power from service much longer than ordinarily. On a system like the Santa Fe, serving a vast territory with numerous diverse industries, certain portions of the system will be experiencing such a heavy traffic period at the same time that another portion will be having its lightest movement. Plotting the traffic movements for a given period, sufficiently long, for all of the separate divisions locates these times of light and heavy business on each, showing at once the relation existing between them, and furnishes a graphical record of the period or periods for each demanding the greatest repair activity. Since these periods vary considerably, not only as between grand divisions, but even between subdivisions of a grand division, this gives opportunity for making adjustments in the times for extraordinary shopping of power from the various divisions as should produce some approach to uniformity in the demands on the shop facilities. In fact, such a scheme perfected to a high degree would provide that each division have assigned to it, for using during a stated period, a given section of the erecting floor in the central repair shop to have its power put in shape for the year, and all preparations made in advance for handling these repairs.

Another interesting feature of the betterment work is the series of assumptions that have been made regarding work and its cost; assumptions which are quite radical, and are only partially in operation. The standard time and standard cost are determined before work is begun, as the article made clear. Since these times and costs are theoretical, as the men approach the time and the foremen the cost they are individually rewarded. This gives the absolute efficiency compared to the ideal for every man, foreman, gang and shop. The actual costs are the theoretical costs with the per cent. of efficiency of the previous month added. This per cent. of inefficiency is the *shop*, not the *operation*, inefficiency. By this system, if work on one axle, for example, takes one hour, costing $1—the standard, say—and another similar one ten hours, costing $10, the standard cost still remains $1 and the $9 of inefficiency is spread over all the shop. This enables the cost of every operation to be predetermined.

Another radical feature is the abolition of overtime. The theory underlying this is, that in the end, overtime not only fails to accomplish its purpose, but conduces to an actual loss in efficiency. A man is capable of just about so much good, conscientious, sustained effort. Compel him to go beyond that limit and there is a reaction of some sort. Either he lies off from work the day following, or if not, his work in all probability will not be up to his usual standard, either in quality or quantity. Let this occur often to a shopful of men and the effect is an appreciable impairment of the efficiency of the entire plant. On the other hand, if the men are worked only regular hours, and an incentive provided that stimulates them to put forth their best efforts during these hours, continuous maximum efficiency will be realized.

Southern Railway.

The tragic death of President Spencer of the Southern Railway, who has been at the head of the company since its formation in 1894, makes a review of its operations of especial interest at this time. For the Southern Railway was the crowning life work and achievement of Samuel Spencer. His was the hand in control from the time the company was formed out of an aggregation of speculatively built and unprofitable railroads in the South up to the present year, which marks a new era in the company's prospects by its provision of suitable capital to take care of future needs through the recently authorized $200,000,000 bond issue.

On February 20, 1894, a modified plan of reorganization for the Richmond & West Point Terminal Railroad & Warehouse Company and its subordinate companies, including the Richmond & Danville Railroad Company and System and the East Tennessee, Virginia & Georgia Railroad Company and System, was issued by the reorganization committee. A previous plan of reorganization had been issued 10 months earlier, but the interval had been a specially disastrous period for railroads everywhere, and particularly in the South, so that a revised plan calling for certain temporary sacrifices not demanded in the original plan was made necessary in order that the new company might bridge over the difficulties of the immediate and dark-looking future. This was to be done largely by the funding of interest payments for a year or two into preferred stock. This detailed plan is most interesting to-day, both as an example of the methods of an exceedingly difficult reorganization and as a showing of the condition at that time of the component parts which make up the heart of the mileage of the Southern Railway to-day. In brief, the plan showed that there were large amounts of speculative bonds outstanding on a mileage of about 4,100 miles of line on which traffic was decreasing, and most of which was in exceedingly bad condition, maintenance charges having been cut to an extremely low level in the endeavor to obtain some net earnings. This was the situation even after excluding from the modified reorganization plan about 1,500 miles of the least profitable lines covered by the original plan on the ground that the new company, in view of the recent unfavorable developments, could not safely carry them.

The 4,100 miles still included earned in the year ended June 30, 1891, about $21,000,000 gross and $6,700,000 net; in 1892, $20,000,000 gross and $6,100,000 net, and in the year ended June 30, 1893, $19,000,000 gross and $5,300,000 net. It was predicted that under the extremely unfavorable conditions prevailing in the fiscal year 1894 about $17,500,000 gross and $4,250,000 net were the best that could be counted on, a prediction later verified by the facts. To provide for the unification of the various outstanding securities of the different roads and the carrying through of the reorganization, the new company issued $120,000,000 5 per cent. first consolidated mortgage and collateral trust bonds, $60,000,000 5 per cent. preferred stock and $120,000,000 common stock, this last being looked on at the time as furnishing a somewhat humorous side to the transaction.

The progress of the reorganized company (the Southern Railway) since that time can best be summed up in the words of Mr. Spencer when submitting to the voting trustees of the road on February 1 of this year a statement in respect to the future financial requirements necessary to properly provide for the rapidly growing traffic and for future development of the property with regard both to further increase in earnings and greater economy in operation—these results to be gained by a new issue of $200,000,000 50-year development and general mortgage 4 per cent. bonds. This statement is as follows:

"In 1894, when the Southern Railway was organized, and the first consolidated mortgage for $120,000,000 was created, the financial requirements were estimated for a system of only about 4,100 miles. In the more than 11 years which have elapsed since organization only $15,100,000 of the consolidated bonds available for improvements and additions have been used, $2,100,000 of which were issued for acquisition of a majority of the stock controlling the Alabama Great Southern. In addition to the proceeds of the remaining $13,000,000, there has been spent in improvement of the property, exclusive of equipment, and charged against income about $5,000,000. Of the consolidated bonds $4,900,000 still remains unsold, but it is evident that this amount is inadequate for the future requirements of the enlarged system.

"Without the use or aid of any first consolidated mortgage bonds the system has been enlarged through purchase, construction, lease and trackage rights by acquisition of railroads aggregating 3,523 miles. In addition the company has acquired a large majority of the stock and of the general mortgage bonds of the Mobile & Ohio Railroad, a one-half interest in a majority of the stock of the Chicago, Indianapolis & Louisville, a one-half interest in a majority of the stock of the Cincinnati, New Orleans & Texas Pacific (Cincinnati Southern), a one-half interest in the stock of the Birmingham Southern, furnishing important terminal facilities in and through Birmingham and the surrounding district, and a one-third interest in the Kentucky & Indiana Bridge & Railroad Company, furnishing the only entrance into Louisville, and the bridge across the Ohio river, connecting the St. Louis and Louisville divisions.

"It has acquired valuable terminals also at 16 of the principal cities of the South—Atlanta, Augusta, Birmingham, Charleston, Chattanooga, Columbia, Durham, Jacksonville, Louisville, Meridian, Mobile, Nashville, New Orleans, Norfolk, Savannah and St. Louis, and since June 30, 1895, it has increased its equipment, including that under contract for delivery during this year, as follows:

Locomotives	From	623	to	1,541,	an increase of	918	; or	147 per ct.
Passenger train cars.	"	487	"	1,000,	" "	513	; "	105 "
Freight train cars...	"	18,924	"	57,929,	" "	39,005	; "	206 "
Roadway cars	"	283	"	1,102,	" "	819	; "	289 "
Being an total increase of.....								203 per ct.

"This equipment addition has been made largely by the issue

of $38,357,590 of equipment trust obligations, of which $26,769,128 are still outstanding and will mature during the next 15 years. Of this total of more than $38,000,000 only about 60 per cent., or $22,971,240, has been, or is to be, charged to capital, while the balance of original cost, $15,386,350, as well as all expense of keeping up the full quota of both old and new equipment, has been or will be charged against income.

"These several acquisitions have been made in accordance with the provision of the consolidated mortgage, authorizing the company

"by the employment of its credit, or of funds not derived from any use of such reserved bonds, or their proceeds, to construct or acquire other lines of railroad, or other branches, extensions, stocks, bonds, or other property, or interests therein, and to create liens thereon, and on the franchises appurtenant thereto, and on the rents, income and profits thereof, which liens, as to all such property, *may be made superior and prior to all liens* thereon by virtue of this indenture."

"Disregarding the Mobile & Ohio, the Alabama Great Southern, the "Monon," the C., N. O. & T. P., the Kentucky & Indiana Bridge & Railroad and the Birmingham Southern, all of which necessarily must be operated and financed separately, on December 31, 1905, the Southern Railway System consisted of lines:

Operated directly (including trackage)	7,446 miles.
Operated indirectly	832 "
Total	8,278 miles.
As compared with that which in 1894, as stated above, was the special object of the 1st Consolidated Mortgage, viz.: an original system of about	4,100 miles.
The gross earnings of the lines operated directly in the year ended June 30, 1895, were	$17,114,792
Those for the current fiscal year will exceed	*51,000,000
Or an increase of more than 192 per cent.*	
The net income above fixed charges for such first year was	895,745
Net income above fixed charges for current fiscal year, about	5,600,000
Or an increase of more than 525 per cent.	
In 1895, gross earnings per mile of road operated directly were	4,134
For current fiscal year they will be over	7,000
In 1895 the bonded debt per mile of road operated was	21,519
At present the bonded debt per mile of road operated is about	22,500
Thus, while the gross earnings per mile of road increased nearly	70 per cent.
The bonded indebtedness per mile of road increased only	5 per cent.

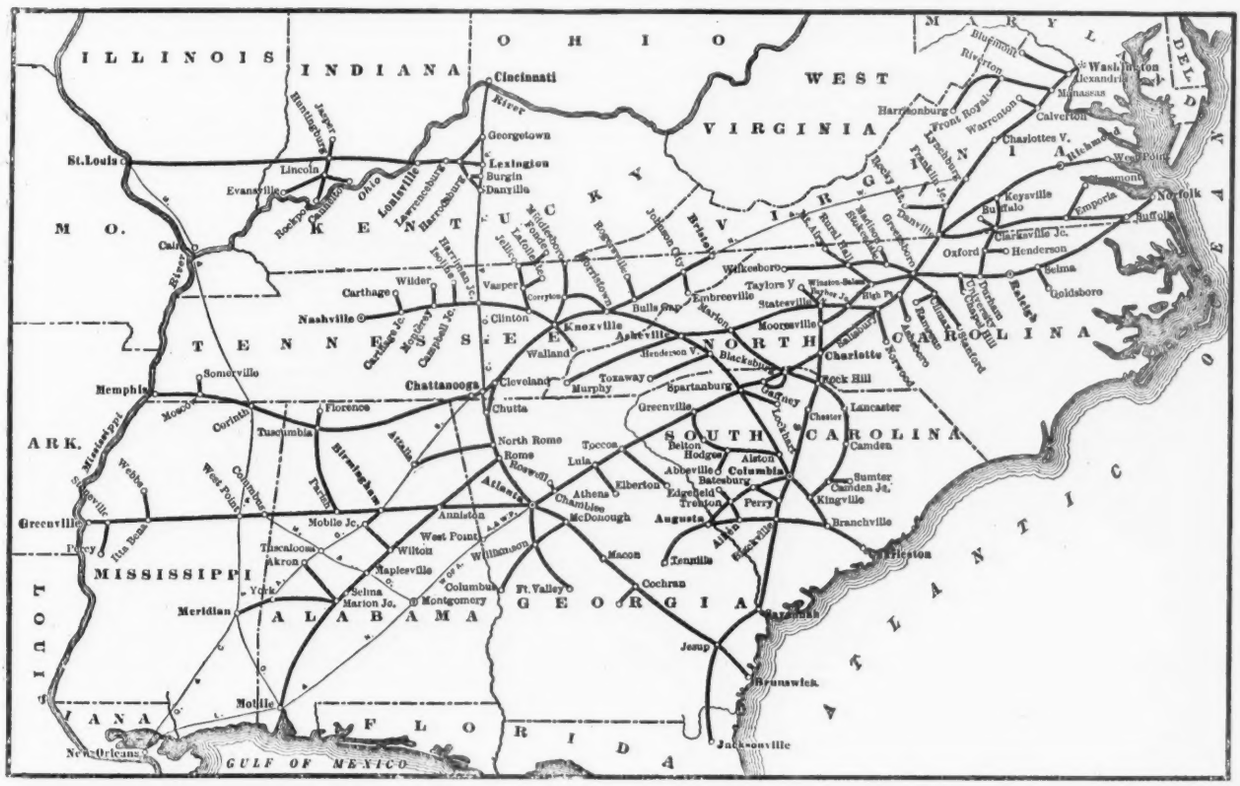
*Actually $53,600,000, or over 200 per cent.

"Upon these facts it is apparent that provision should be made for capital sufficient not only to fund the capital obligations and divisional prior lien bonds which, as stated above, have been created outside of the consolidated mortgage, but also to provide for future additions and for improvements and betterments on the entire system. The large growth of traffic on all lines for the last few years, and the rapid development of the entire South, necessitate improvements and extensions on a scale much larger than heretofore, in the form chiefly of double track, revision of grades and curvature, block signals, additional shops, enlarged yards and other terminals for passengers and freight, additional equipment and the construction of branch lines and feeders. Many of these improvements should be contracted for now if the property is to continue to share in, and to induce, the general development of the South, and thus participate in the resulting prosperity and increased earnings which may be reasonably expected.

"The Board of Directors therefore has determined that in accordance with the policy and purpose of the first consolidated mortgage, as quoted above, there should be created a new mortgage which is to be a prior lien upon certain additional properties already acquired, and is to make provision to fund the existing divisional prior lien mortgages not provided for by the consolidated mortgage, thus in due course becoming a prior lien on the properties covered by those mortgages also, and which will be a general lien upon all of the system now subject to the consolidated mortgage, so as to provide for the proper development thereof.

"It is proposed, therefore, to create a new mortgage to be known as the development and general mortgage, which is to secure 50-year bonds maturing April 1, 1956, to be issued in lettered series, bearing interest at not exceeding 4 per cent. in a total authorized amount of $200,000,000, of which there are to be reserved for refunding purposes, acquisitions and betterments, to be issued for betterments at a rate not exceeding $5,000,000 a year, $185,000,000, and of which $15,000,000 are to be issued at once. That the existing financial condition of the company is such as to justify the creation of the new mortgage, and the immediate issue of the $15,000,000 of new bonds as proposed, without disturbance of the full dividend now paid upon the preferred stock, will appear from the following facts: The net income of the company, after paying all existing fixed charges for the current fiscal year will be about $5,600,000; the interest per annum, at 4 per cent. on the proposed immediate issue of $15,000,000 of new bonds would be $600,000. If the $15,000,000 of new bonds were outstanding for the entire fiscal year, the net income would be sufficient to pay the additional fixed charges, and the full dividend on the preferred stock ($3,000,000) and over and above all this there would remain a surplus income for the year of about $2,000,000."

This statement presents in a large view the development of the reorganized company during the first 11½ years. The annual report now at hand completes the record for the twelfth year. The total mileage operated on June 30, 1906, was 7,516 miles, against 7,195 miles a year previous, a gain of 321 miles. This is largely made up of the eastern division of the Tennessee Central from Nashville to



Southern Railway.

Harriman, Tenn., with branches, 206 miles. On this road the Southern Railway and the Illinois Central jointly obtained a three-year option in July, 1905, the road being, for operating purposes, divided at Nashville, the Illinois Central taking the western portion and the Southern the eastern portion, thus giving each system direct access to the city of Nashville. Another acquisition was the Transylvania Railroad, which runs from Hendersonville, N. C., to Lake Toxaway, 42 miles, which was leased on January 1, 1906. The Cumberland Railroad and the Delta Southern, controlled companies, each built 11 miles of line during the year. An important acquisition to the general traffic of the system, not included in the 321-mile increase of mileage, was the purchase of the Virginia & Southwestern, which has about 125 miles of line in the coal fields and iron districts of southwestern Virginia, to which it gives the Southern Railway entrance. The increase in average miles operated during the year was 175 miles.

Gross earnings were $53,600,000, a gain of $5,500,000 over 1905; operating expenses increased $4,500,000, leaving net earnings of $15,367,000—larger by nearly $1,000,000 than in 1905. There was a balance after dividends on the preferred stock, equal to nearly 2 per cent. on the common. From this about $1,000,000 was appropriated for improvements.

The total cost of new equipment contracted for during the year was $13,800,000, of which $1,685,000 was paid in cash and equipment obligations issued for the balance of over $12,000,000, a striking exhibit of the betterment of the property in one important department. The Southern is weak in its way and roadbed department. Considerable improvements have been under way, mostly building of short strips of second main track and revision of grades and curvatures. There were 67,947 tons or 542 miles of new 75-lb. or heavier rail laid during the year, as compared with 45,840 tons, or 372 miles during the previous year. At the same time a more extensive programme for future work of this sort is outlined in the report. A large number of new stations are now under construction and also large improvements to the company's shops.

The records of the industrial department are interesting as reflecting the tremendous growth in prosperity now under way in the South. There were put in operation during the year 34 textile mills, 257 lumber mills, 95 stone quarries and coal mines, 48 woodworking plants, 27 furniture factories, 34 iron industries, 12 fertilizer works, 58 brick works, 2 tanneries and 499 miscellaneous smaller industrial plants, besides 454 additions and enlargements to existing plants and 162 new and additional industries in course of construction at the close of the year. One problem which this industrial development has brought before the South, which is being met by the Southern Railway, is the need of labor from outside regions. This difficulty is to be overcome through the attraction of immigration both from Europe and from other parts of the country to southern territory.

From this brief review of the history and present condition of the Southern Railway it is evident that Mr. Spencer had brought the property to a period of great prosperity, and also that his work was brought to a close at a time when large new problems of utmost importance are confronting the road. There has been an increase of traffic so great that the originally poorly constructed roads, which make up a large part of the system, even with the improvements which it has been possible to make with the funds available, have been entirely inadequate to handling the present traffic. For this reason there have been grave delays to freight traffic and accidents of more or less seriousness have been common. It is possible to lay the cause of the accident in which Mr. Spencer met his death to the crowded condition of the system. The Southern is now at a point where a broad programme of general improvements must be carried out. Various parts of the system must be double-tracked, there must be new and longer sidings throughout the lines and grades and curvature, now in many instances excessive, must be cut down to a point compatible with efficient operation. More than this, and we should judge to be drawn as the most striking lesson of Mr. Spencer's death, the block system must be installed and strengthened throughout the lines. The work of the past 12 years is the work of a railroad genius; the necessities of the next 12 years would seem to require equally high ability. Fortunately, the way has been paved for the success of the improvement programme by the comprehensive bond issue planned by Mr. Spencer.

The principal statistics of the last two years' operation are as follows:

	1906.	1905.
Mileage worked	7,374	7,199
Passenger earnings	13,341,181	12,637,195
Freight earnings	36,141,547	31,775,326
Gross earnings	53,641,439	48,145,108
Maint. way and structures	7,122,355	6,458,859
Maint. of equipment	8,588,452	7,456,736
Conducting transportation	20,810,940	18,195,504
Operating expenses	38,274,102	33,700,714
Net earnings	15,367,337	14,444,394
Net income	5,229,066	5,151,632
Appropriations for betterments	999,827	1,056,549
Year's surplus	1,229,239	1,095,083

Missouri Pacific.

The Missouri Pacific is the heart and center of the Gould system, which is reaching out both east and west for a through transcontinental line under one management. The Missouri Pacific is made up, territorially, of two parts, separated in general by a line drawn southwest from Kansas City. North of this imaginary line are the lines of the Missouri Pacific proper, including the Kansas & Colorado Pacific and the Central Branch, as the two next important roads of the group. South of the imaginary line are the St. Louis, Iron Mountain & Southern lines, which include, besides that road, a number of short independent lines not operated by the larger corporation, but separately, paying their own expenses, surplus earnings, if any, being passed in the form of dividends to the Gould ownership in control. In the northern group there is a through line from St. Louis to Kansas City and from Kansas City to a connection with the Denver & Rio Grande at Pueblo, Colo., a line from Kansas City northwest to Omaha and from Kansas City south to Coffeyville, Kan., where an Iron Mountain line from the southeast makes connection, together with a large mileage of long and short branches, mainly in Kansas, but also in southeastern Nebraska and western Missouri. The southern group includes the old St. Louis, Iron Mountain & Southern main line from St. Louis to Texarkana, Tex., with numerous branches, and is coming to include a second north and south line from St. Louis, along the Mississippi river, to New Orleans, the last 200 miles of this line being over the Texas & Pacific from Ferriday, La., south. There are also two connections with the Missouri Pacific lines proper—the one already mentioned at Coffeyville, the other the recently completed White River division at Carthage, Mo., which is near the southeast corner of Kansas.

The Missouri Pacific system, as a whole, has been developing and rounding out in the past few years, the White River division and the River and Gulf low-grade line being the most important items. The White River division has been under construction since June, 1901. The whole 300-mile line from Diaz, Ark., on the main line of the Iron Mountain, northwest to Carthage, was opened at the beginning of the current year. It cost about $10,000,000. This is a well-built line, with satisfactory grades and curvature, which were obtained partly through building a half-mile tunnel, and part of it laid with heavy rail. Besides the connection which it gives with the Missouri Pacific lines another connection is to be obtained by construction of a line shown on the map from Eldon, Mo., on the branch running southward from Jefferson City to Springfield, Mo., to connection with a branch of the White River division already built.

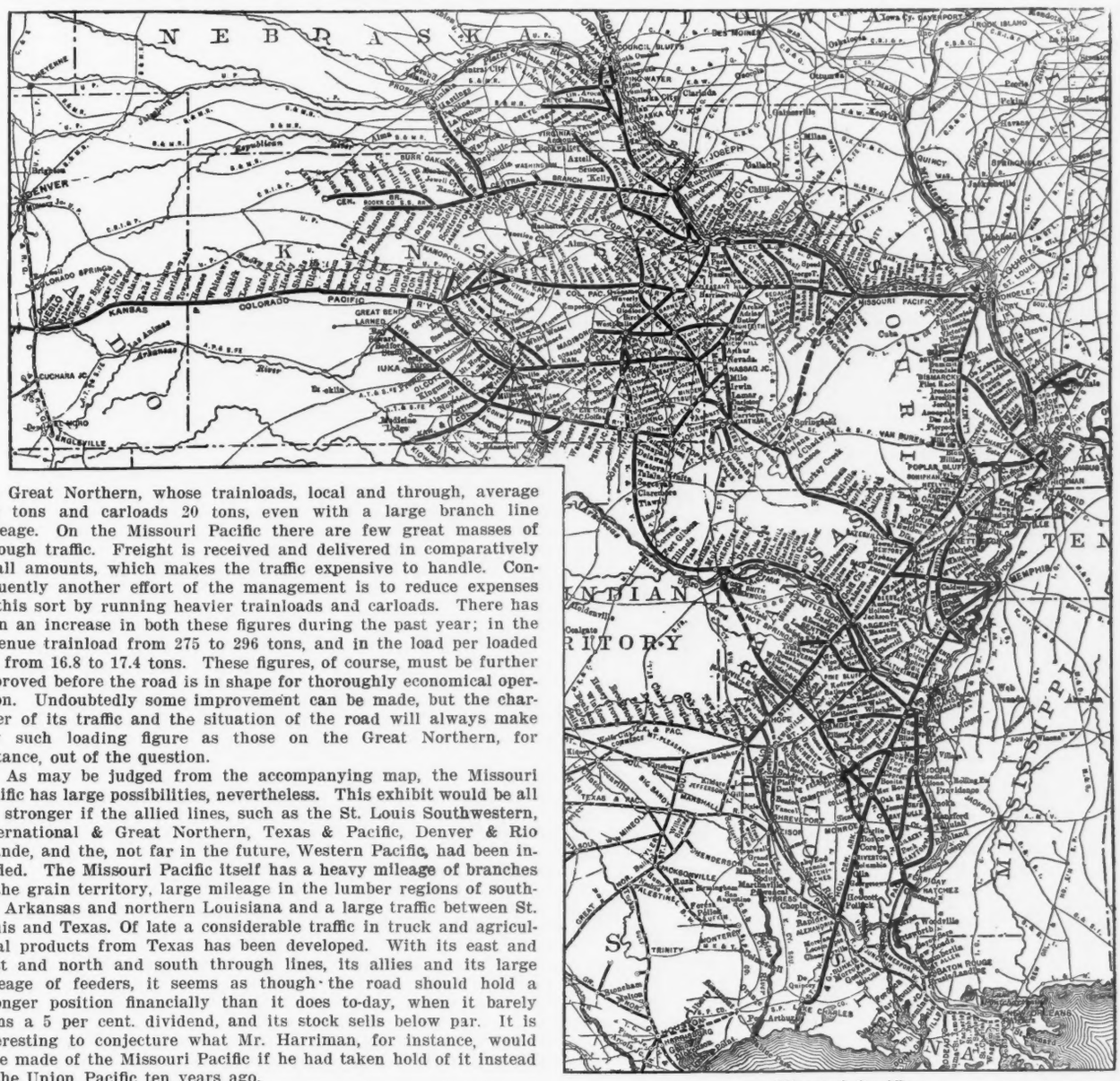
The River and Gulf division is at present made up of a low-grade line from East St. Louis along the east bank of the Mississippi river to Thebes bridge, across this bridge and south 110 miles by trackage rights over the St. Louis Southwestern, a Gould road, to Paragould, Ark., thence south over Iron Mountain lines via Wynne, Marianna, McGehee, Lake Village and Eudora, Ark., and Clayton, La., to Ferriday, where the Texas & Pacific line is met. Parts of the through line which is planned have still to be built, the most immediate construction building being a connection from Marianna, on this through route, northwest to Memphis. In carrying out this plan for a low-grade line between St. Louis and New Orleans via Thebes bridge, extensive improvements have been made. On the Memphis division terminal yards have been built at Paragould and Lexa, Ark., grades reduced, alinements changed, bridges added and strengthened, 85-lb. rails laid, passing tracks built and other work done to prepare that section of the line for heavy traffic.

Another new line which is to shorten this through route to the Gulf is projected from Eudora, Ark., southwest to Gilbert, La., 77 miles. Of this 37 miles is graded and 12 miles of 85-lb. rail is laid south from Eudora. Under the name of the Gurdon & Fort Smith and the Gurdon & Fort Smith Northern railroads a cut-off is being built from the point where the Iron Mountain line northeast to Coffeyville, Kan., crosses the Indian Territory-Arkansas state line to a connection with the Texarkana main line and thence to the low-grade line to the Gulf. Work is under way on this cut-off, but it will not be finished for some time. When completed it will considerably shorten the Missouri Pacific line from Kansas to the Gulf. Except for some connecting up of branches these projects represent the new construction work of the system.

It will be observed that the object in each case is not, primarily, to develop new territory, although the new lines do this to a greater or less extent, but to unify the system by bringing its various points into more direct connection with one another. The Missouri Pacific has been a disjointed system with roundabout routes for a great deal of its through traffic. It has a great quantity of branch line mileage, but has lacked efficient through lines. In consequence the effort is now being made to weld together the separated parts into a complete whole, and along with this process to develop new and shorter through routes, particularly for traffic from all points on lines in the northern group south to the Gulf. This Gulf traffic, together with a large local business, makes up the larger part of the road's freight. The drawback to the Gulf business is that it is always highly competitive. With its not specially efficient lines to

the southward the Missouri Pacific has in the past, although carrying at times a remarkably large proportion of the traffic, obtained a low proportion of net return from this competitive business. At one time the road was able to obtain a large southbound traffic only by cutting rates on grain to the Gulf to 9 cents from Kansas City. Since this export grain does not carry high rates, largely because there are so many hands stretched out to grasp it, the necessity of developing economical and efficient lines to the south has been a strong one, and is the backbone of the construction policy which we have outlined.

Another reason why operating efficiency must specially be considered is the local character of a great part of the traffic. The Missouri Pacific is the greatest sort of a contrast with a road like the Great Northern, whose trainloads, local and through, average 530 tons and carloads 20 tons, even with a large branch line mileage. On the Missouri Pacific there are few great masses of through traffic. Freight is received and delivered in comparatively small amounts, which makes the traffic expensive to handle. Consequently another effort of the management is to reduce expenses of this sort by running heavier trainloads and carloads. There has been an increase in both these figures during the past year; in the revenue trainload from 275 to 296 tons, and in the load per loaded car from 16.8 to 17.4 tons. These figures, of course, must be further improved before the road is in shape for thoroughly economical operation. Undoubtedly some improvement can be made, but the character of its traffic and the situation of the road will always make any such loading figure as those on the Great Northern, for instance, out of the question.



Missouri Pacific.

As may be judged from the accompanying map, the Missouri Pacific has large possibilities, nevertheless. This exhibit would be all the stronger if the allied lines, such as the St. Louis Southwestern, International & Great Northern, Texas & Pacific, Denver & Rio Grande, and the, not far in the future, Western Pacific, had been included. The Missouri Pacific itself has a heavy mileage of branches in the grain territory, large mileage in the lumber regions of southern Arkansas and northern Louisiana and a large traffic between St. Louis and Texas. Of late a considerable traffic in truck and agricultural products from Texas has been developed. With its east and west and north and south through lines, its allies and its large mileage of feeders, it seems as though the road should hold a stronger position financially than it does to-day, when it barely earns a 5 per cent. dividend, and its stock sells below par. It is interesting to conjecture what Mr. Harriman, for instance, would have made of the Missouri Pacific if he had taken hold of it instead of the Union Pacific ten years ago.

The present report is the first full statement of operations issued for 18 months. Owing to a change in the fiscal year, an absurdly brief statement covering operations of the calendar year 1905, was issued to the stockholders in April of this year. This showed that the 2½ per cent. dividend for that period was not earned by $18,000. The poor showing was, according to the report, due to a number of unfortunate circumstances—the yellow fever epidemic, a shortage in the cotton crop and severe floods. Last year a better showing was made; gross earnings were $44,500,000, an increase of $3,500,000 over the fiscal year ended June 30, 1905. Operating expenses increased $2,250,000, leaving net earnings larger by $1,250,000 than in that year, while net income was larger by $896,371 than in 1905. It is to be observed at this point that net income for both years was bolstered up by the payment of the first and second dividends ever paid on Central Branch stock, which is all owned by the Missouri Pacific. These amounted to over $1,000,000. Owing to the fact that in order to harmonize dividend payments with the changed fiscal year, three dividends (7½ per cent.) were charged against the income of the 12 months, the surplus after dividends was $492,710, against $1,541,310 in the previous corresponding year. It must be borne in mind, however, that since from the income of the six months, January-June, 1905, during which time no dividend was charged, there was a net income of $991,899, there remained, after paying the three dividends of 2½ per cent. each, a surplus from the earnings of the 18 months, January, 1905, to June, 1906, of $1,484,608. Therefore, looking at the 18-month period as a whole, by calling on the surplus earnings of its subsidiary, the road came through with a small but reasonably safe margin above dividend requirements.

Passenger earnings were $30,000 smaller, as compared with the preceding and corresponding 12 months, which, however, included the last five months of the St. Louis Exposition. In these five months of 1904 passenger earnings increased $1,320,000 over the corresponding five months previous. It is on this account that the present year's passenger earnings, which, for the first six months of 1906, increased $956,720 over the same period in 1905 when conditions were normal, show a decrease. The report draws attention to the fact that the introduction of train auditors has proved very satisfactory in its results. An indication of the growth of normal passenger traffic is the increase of 1,382,665 local passengers carried for the year.

Freight earnings increased $3,300,000, or 11 per cent. With the exception of cotton traffic, which was affected by crop shortage and yellow fever in Louisiana, substantial increases are reported in the principal commodities carried. It is to be here noticed and with disappointment that the practice of including statistics of commodities in the annual report has this year been discontinued, an unfortunate step to be taken by any railroad management. The former

reports, which have been in many ways very unsatisfactory, have contained this table, which is perhaps of greater importance than any other single set of facts in determining the real condition of a railroad, and particularly of a railroad like the Missouri Pacific, with its large local traffic, most of it originating on its own lines. On the other hand the report has, for the first time, been brought somewhere nearly in harmony with the Interstate Commerce Commission classification of expenses, so that there is a chance to separate to some degree the maintenance of equipment and conducting transportation accounts, which formerly both shared in the expense classification, "motive power." Nor was a detailed table of expenses given under the old system.

On account of this change in accounting method, no comparison with the previous year is available in the detailed expense accounts for 1906. It is possible to compare the unit maintenance of way charge, however, which was $857 per mile against $782 in 1905. Last year maintenance of equipment cost $2,840 per locomotive, $625 per passenger car and $51 per freight car. These are, on the whole, fairly satisfactory figures, although the maintenance of way figure seems rather small, even with the large amount of branch line mileage and its considerable increase over 1905. Conducting transportation required $17,142,000, or 57 per cent. of the total $30,282,000 operating expenses.

There was an increase of 19 per cent. in the number of passengers carried, a decrease of 12 per cent. in the number of passengers carried one mile, and a decrease of 26 per cent. in the average distance each passenger was carried. These three facts sum up the increase in general passenger traffic and the loss in the long distance traffic in 1905, due to the Exposition. Ton-miles of revenue freight increased 17 per cent. and tonnage 12 per cent. There was an increase of 4 per cent. in the number of loaded cars and a decrease of 6 per cent. in the number of empty cars per train mile, this, with the increase in the train- and carload already mentioned, showing better efficiency.

The industrial department has been active during the year. There were established 457 industries on the line, employing $24,834,000 capital, and pledged to deliver annually for shipment 190,980 carloads of freight. These industries were of 33 classes, including saw-mills, furniture and vehicle factories, cement and brick plants, coal mines, zinc and lead smelters, foundries and machinery factories, cotton gins, compressors and oil refineries, stone quarries, glass factories, flour mills and elevators, creameries and canneries. The mineral district opened up along the White River line has begun to produce high grade ores. There are as yet undeveloped in the country tributary to the lines in Kansas, Missouri and Arkansas, deposits of granite, lime stone, marble, onyx, fullers earth, barytes, asbestos, asphalt and other clays and minerals. Special attention has been given to promoting scientific agriculture along the lines in co-operation with state agricultural colleges and experimental stations and the Federal department of agriculture.

The Little Rock & Monroe, a line 43 miles long from Felsenthal, Ark., south to Monroe, La., was acquired and its construction finished, so that it was open for operation November 1, 1905. A terminal yard with 38 miles of track is now under construction at Dupo, on the Illinois division, opposite Carondelet, Mo., to provide a terminal on the east side of the Mississippi river and to facilitate the interchange traffic over the Ivory Ferry Transfer. At Kansas City, Mo., a large classification and division yard has been built in the East Bottoms.

To secure more efficient operation the lines have been divided into three grand districts, the northern, southern and central districts, each in charge of a general superintendent. The northern district comprises the main lines from St. Louis to Pueblo and line lying to the north; the southern district the main line, St. Louis to Texarkana, and lines lying to the east, and the central district the divisions lying between these main lines. Three new operating divisions were created during the year, the Northern Kansas, Memphis and Wichita. Floods and damage to tracks and bridges during the year to the amount of $211,000 caused serious interruptions to traffic, particularly between St. Louis and Kansas City, where through traffic was suspended for one week in September and one week in October, 1905. High water and washouts also occurred between St. Louis and Texarkana and on the Joplin, Omaha and Central Kansas divisions.

The principal statistics of operation for the year ended June 30, 1906, for the Missouri Pacific, including the St. Louis, Iron Mountain & Southern and the Central Branch are as follows:

	1906.	1905.
Mileage worked	6,276	6,205
Passenger earnings	$8,753,141	$8,783,054
Freight earnings	32,563,507	29,261,894
Gross earnings	44,566,821	41,067,282
Maint. way and structures	5,378,125	4,852,580
Maint. of equipment	5,781,533	4,479,340
Conducting transportation:		
Operation	16,070,829	.....
Traffic.	1,071,155	.....
Total	17,141,984	16,977,765
Operating expenses	30,282,405	28,031,892
Net earnings	14,284,416	13,035,391
Net income	6,329,015	5,432,178
Dividends	5,836,305	3,890,868
Surplus after dividends	492,710	1,541,310

NEW PUBLICATIONS.

Railroad Location, Surveys and Estimates. By F. Levis. New York: The Myron C. Clark Publishing Co. 270 pages, 6 in. x 9 in.; 73 illustrations. Price, $3.00.

Once in a while a scientific book appears that combines the threefold elements of mastery of the subject, clearness of expression and elegance in the use of English, a combination as rare as it is attractive. The book at hand, on the apparently dry subject of railroad location and surveys, is of this sort, and the interest of the reader or student is held through every line of the text, and page after page is turned with no more thought of effort than in an interesting story. Aside from this characteristic feature the reader is impressed by precept upon precept with the necessity of combining, in all railroad surveys, thoroughness and an eye to the commercial necessities of avoiding unnecessary refinements, and again and again throughout the work is the call for the use of a well-trained and mature judgment to determine to what extent this thoroughness and refinement of the work shall be carried. The end to be aimed at is to obtain the best line the country affords at a minimum of expense, not only for surveys and construction but in operation, later, and the idea of a proper capitalization of these expenses is kept constantly in view.

First of all, it is urged that the locating engineer must be more than familiar with the country; he must be steeped in its peculiarities and possibilities so that he is able to consider the line, not only in the broad and general features which it must possess but in the details of each and every station. This can only be done by careful reconnaissance and by freeing the chief of the party from the details of the instrument work and the personal guiding of the men in the duties of the day, which should be left to the assistant. All through the book the value of careful topographical work is insisted upon and a high estimate is put upon this department. At the same time there is the feeling of the drive behind the workman and that speed, speed, speed is of prime importance and yet everything must be accurate, and accuracy is never to be sacrificed at any place for any consideration. There is a "genius who, disdaining plats, approaches the hillside boldly line in hand, takes a glance at the point of curvature and the degree of the curve that will fit the hill comfortably, and at the proper point on the curve sails off on a tangent that will strike the bull's-eye two miles away. Nothing would be more dangerous than to encourage the idea that such things are possible; once in a great while the genius might hit the bull's-eye; but nine times out of ten the man in his tent at night with his map and all his facts before him, and by all means the most important, thoroughly familiar with the ground, will be fitting in tangents that will do away with the curves of the 'genius' and hit the bull's-eye every time."

While the book gives a broad and comprehensive idea of the scope and method of doing the work, details are by no means neglected. One feels that it would be very easy to organize, equip and guide a party in the field, so minute and interesting are the instructions that are given, from the number and duties of the men, the means of getting them into the field, the camp, its pitching and moving and the management of its supplies, to the equipment and care of the instruments, the clothing, shoes and personal belongings of the party. Special attention is given to the sanitary precautions to be taken to keep all in health, for a railroad survey "is no place for a weakling." And through it all we are told of the value of courtesy; courtesy to the men that their loyal and earnest support may be obtained, and courtesy to the residents along the line, that the road may be built among its friends, and those friends may be willing to furnish the engineer with invaluable information regarding characteristics of the country, such as floods and natural phenomena that mean so much in time and money, not only in the rapidity and economy with which the survey can be made but also in the operation of the road when it is completed. Systematic work, especially in keeping notes, is insisted upon: notes that are not only intelligible to the man who made them on the morning after, but to the stranger who may have occasion to use them ten years later. For this, pages of notes from the books of the transit man, leveller and topographer are given in full so that the student can take them and plot the work that they refer to.

With such intensely practical instructions along the whole line of the location, it is not strange that the man who is working for rapidity and accuracy without needless refinement and an eye to commercial results should place a rather low estimate upon the value of higher mathematics, and in this he but follows in the lead of other successful engineers. After referring to certain calculations regarding the relation of the projected location to the preliminary lines and noting that the curves will take care of themselves if the tangents are in the right place, the author says, "in view of the fact that from time to time it has seemed necessary to exploit special solutions of so-called difficult curve problems in the technical journals, the writer would wish to impress on the many young men who are first beginning on any curve problems, the fact that he has never yet had occasion to use in the solution of any curve problems which he has encountered in actual railroad prac-

tice, any other mathematical knowledge than a good working acquaintance with geometry and the ability to solve plain triangles by trigonometry, but would impress on all of them the necessity of having these at their fingers ends and as readily available as the multiplication table."

The book has a constant eye to cost, not only in the discussion of the broad work in rough and unsettled countries, but especially in the chapter on suburban rapid transit railways, where attention is called to the sometime necessity of ignoring the natural topographical features of the country on account of the avoidance of grade crossings, expensive buildings and artificial obstructions which would be expensive to remove.

This review should not close without a reference to the exceedingly interesting chapter on surveys in tropical countries, in which the author has surpassed himself in the conciseness and clearness of his statements as to what should be done, and what should be expected in the prosecution of work. There is nothing that is not apropos to a strictly scientific statement of the subject in hand and yet it reads with the interest of a novel. Finally the interest is kept up even in the usually dry methods of making estimates and determining warranted costs, all of which are outlined with great clearness and thoroughness. In fact, the only portion of the book that is not replete with interest is the tabular matter of tangents and externals and the geometrical formula at the close, and the reader is quite apt to swing into these with an entirely different feeling from that with which such data are usually approached; while the astronomical information in the appendix for the determination of location is clear in the extreme. In short, the book is one of those rare productions in which there is not a wasted word and whose scientific value is high in that it tells clearly and concisely just what every student and engineer should know. The reader, however, must have some knowledge of the subject, for no attempt has been made to give instructions in such details as the manipulation of the instruments or "the running or calculating of curves, as men on whom these duties devolve on a locating party should have learned them elsewhere."

CONTRIBUTIONS

Safety at Meeting Points Under the Standard Code.

Ruby, S. C., Nov. 26, 1906.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I note the following particulars in the statement of F. C. Batchelder, Superintendent, respecting the Woodville disaster. That a heavy storm of wind and snow was raging, and that under these circumstances the crew of a heavy freight train had no other means of learning that a heavy passenger train running in opposition to them was in two sections instead of one than that of seeing signal lights on the first section as it passed them.

That seems to be the only possible meaning of the terms of Mr. B.'s statement as given, in apparently literal repetition, in some papers. It seems almost incredible that the facts should be as stated. It also seems highly discreditable—a transparent absurdity if nothing worse—to attempt to confine the "responsibility" or blame to the two train crews.

There is something radically wrong in a system of rules, or the mode of handling them, which would suspend the possibility of such an accident as occurred in this case on so slender and brittle a thread and send two such immense forces, freighted with such vast possibilities of pain, agony and death to human beings towards each other with such slight safeguards as this.

It would certainly seem that from a system that takes so little account of weather and other unfavorable conditions certain to occur, the idea of the "factor of safety" that the engineer has to use in constructing his bridges is entirely omitted; and that it is high time that something like it was introduced into railroad operation.

CHAS. H. SCOTT, C.E.

[It is not exactly fair to say that there is no factor of safety. It is true that a second class train waiting on a side track at a non-telegraph station for a first class train has no means of knowing how many first class trains there may be on a certain schedule, except by what can be learned by looking at the engine of the first passenger train. But the conductor and the engineman of the second class train both are bound by a strict rule that if (at night) they do not see the lights on the engine, or do not see the front of the engine clearly enough to assure them that no lights are there, they must keep their train on the side track. They have no right to occupy the main track without knowing that a first class train passing them is the last one running on that schedule. On most roads there is another factor of safety. The engineman of the first class train, when displaying signals for a following train of the same class as his own, is required to sound his whistle, as a means of calling the attention of the men in charge of any inferior train standing on any side track. The engineman on the side track must, in response, sound the whistle of his engine; and if this response is not given, the engineman of the first train must stop and find out what is the matter. From the reports thus far received, it appears that failure in this last particular was the main element in the cause of the collision at Woodville. It is said that the engineman of the passenger train sounded his whistle, but failed to receive a response; and then did not stop to learn the cause of the failure. It is obvious, of course, that the two factors of safety named must be supplemented by a third factor—careful and vigilant men, well trained to strict compliance with rules. It is true that this factor is absent in many cases. A high standard of efficiency in this feature of train management seems to be lacking on many roads. Many roads have adopted the block system as the only practicable cure for this kind of error.—EDITOR.]

Disastrous Collision at Lawyer, Va.—President Spencer Killed.

In a rear collision of passenger trains on the Southern Railway near Lawyer, Va., 11 miles south of Lynchburg, on the morning of November 29, the rear car of the leading train, occupied by Mr. Samuel Spencer, President of the road, and a party of guests, was completely wrecked; and Mr. Spencer, Gen. Philip Schuyler, one of his guests, a telegraph operator, a porter and another employee in this car were killed, and Mr. Merrill, private secretary of the President, was injured. One passenger and a fireman were also killed, and several passengers in other cars were injured. Southbound passenger train No. 33 passed Rangoon at 6.06 a.m., but appears not to have been reported by the block signal operator to the operator at Lawyer, the next block station to the south. The train was stopped a mile short of Lawyer, in consequence of the breaking of the knuckle of the coupler on the front end of the leading car of the train. While the coupler was being repaired the train was run into at the rear by train No. 37, which passed Rangoon at 6.14 under a clear signal. The operator at Lawyer, being ignorant of the presence of train No. 33 in the block, made no objection to the admission of train No. 37. The operator at Rangoon, G. D. Mattoax, disappeared about one hour after the collision, and it was reported that he had absconded; but on Saturday, two days after the collision, his brother came out with the statement that he had been at his home, within a mile of the wreck, all the time, and had not tried to evade the officers of the law, who, it was said, had been searching for him. The brother said that the reason train No. 33 was sent forward without notice was the inability of Mattoax, at Rangoon, to raise the operator at Lawyer.

It is said that the flagman of train No. 33 went back promptly, but no accurate information has been given as to the time or the distance. The superintendent of the road is reported as saying that the flagman did his whole duty.

Washington Correspondence.

WASHINGTON, Nov. 27.—Since the Hepburn law became effective the Interstate Commerce Commission has received a large number of informal complaints of through rates that are higher than the sum of the local rates between the same points, some of the complainants suggesting a general order reducing all such through rates to the sum of the locals. The commission has taken the ground that it is not empowered to make such an order and can only act after full hearing on a formal complaint as to specific rates. It has announced, however, that a through rate which is higher than the sum of the locals between the same points will be considered *prima facie* unreasonable and that the burden of proof will be upon the carrier to defend the higher rate and establish its reasonableness.

This is expected to lead to the filing of formal complaints as to certain rates that have been complained of informally and to decisions that will show what are the conditions that in the opinion of the commission will justify a higher through rate. It is probable that the roads will contend that such rates are justified where local rates are kept down by independent competition on one or both sides of an intermediate point, while there is no competition for the through traffic, and, also, where local rates have been reduced to an unreasonably low level by a state commission. It can be contended that to allow a state commission to force the reduction of interstate rates by reducing local rates within the state would give the state power to regulate interstate commerce. There have been cases in the past in which state commissions have virtually controlled the fixing of interstate rates by using or threatening to use their power over state rates, and it is probable that, sooner or later, the question of whether interstate rates can be controlled by state action will be threshed out thoroughly in the United States courts.

A striking illustration of an attempt by a state commission to control important interstate rates may be afforded by the action of the Georgia commission within the next few months. One of the principal issues in the political campaign in that state was the question of freight rates from the Georgia ports to Atlanta, and it is expected that the new governor will appoint a commission that

will order reductions in those rates. Though a shipment by water to a Georgia port and thence by rail to Atlanta is an interstate shipment it is doubtful whether it can be brought under the jurisdiction of the Interstate Commerce Commission and whether the carriers can be sustained in making a higher charge for such a shipment than the sum of the water rate to the port and the rail rate to Atlanta. Yet, unless this can be done, the action of the Georgia commission would control not only the rail-and-water rates to Atlanta but the all-rail rates as well, and would thus open the broad question as to whether interstate rates can be regulated by state authority.

J. C. W.

Football Travel on the Pennsylvania and the N. Y., N. H. & H.

The following tables give detailed statements of the passenger travel on the days of the Yale-Princeton football game at Princeton on November 17, and the Yale-Harvard game at New Haven on November 24. The statement showing this traffic on the Pennsylvania includes both incoming and outgoing travel; the New Haven's statement shows only the travel *to* New Haven. It will be observed that, on the assumption that twice as many passengers were handled as the total travel to New Haven, as it appears from the summary of the travel to Princeton can be with fair accuracy assumed, the New York, New Haven & Hartford carried some 43,000 passengers as against 33,363 carried by the Pennsylvania.

STATEMENT OF TRAVEL TO AND FROM PRINCETON, ACCOUNT YALE-PRINCETON FOOTBALL GAME, AT PRINCETON, NOV. 17TH, 1906.— PENNSYLVANIA RAILROAD.

From Jersey City.

Train.	Leave Jersey City.	Arrive Princeton.	Total cars.	Passengers.
Extra 317	8:47 a.m.	10:05 a.m.	10	574
" 683	9:24 "	10:34 "	9	411
" 676	9:39 "	11:06 "	10	544
" 81	9:43 "	11:12 "	10	684
" 2995	9:52 "	11:15 "	10	448
" 95	9:56 "	11:20 "	10	522
" 2037	10:12 "	11:27 "	10	486
" 1046	10:37 "	11:55 "	10	822
" 2221	10:43 "	12:02 p.m.	10	602
" 904	10:51 "	12:09 "	10	609
" 963	10:52 "	12:12 "	10	491
" 1072	10:56 "	12:21 "	4	101*
" 3153	11:05 "	12:25 "	10	797
" 612	11:46 "	12:30 "	10	749
" 2771	11:24 "	12:37 "	10	782
" 1408	11:34 "	12:49 "	10	813
" 2444	11:45 "	12:54 "	10	810
" 820	11:53 "	1:03 "	10	518
" 2038	12:05 p.m.	1:21 "	10	419
" 2216	12:52 "	1:59 "	10	362†
" 642	11:20 a.m.	12:46 "	10	332‡
" 1232	11:55 "	1:13 "	10	182‡
Total...22 trains.			213	12,058

From Princeton.

Train.	Leave Princeton.	Arrive Jersey City.	Total cars.	Passengers.
Extra 1406	3:58 p.m.	5:11 p.m.	10	768
" 2221	4:02 "	5:15 "	10	748
" 904	4:06 "	5:19 "	10	656
" 3153	4:08 "	5:22 "	10	697
" 612	4:13 "	5:35 "	10	706
" 2771	4:18 "	5:49 "	10	730
" 2444	4:22 "	5:58 "	10	675
" 820	4:28 "	6:03 "	10	870
" 2038	4:33 "	6:09 "	10	754
" 2216	4:37 "	6:13 "	10	716
" 965	4:49 "	6:27 "	10	833
" 2517	4:55 "	6:31 "	10	782
" 483	5:02 "	6:49 "	10	784
" 1072	5:17 "	6:58 "	4	106*
" 2995	5:15 "	6:53 "	10	783
" 676	5:16 "	6:51 "	6	696
" 95	5:54 "	7:37 "	10	455
" 683	6:22 "	7:50 "	1	10°
" 1158	6:54 "	8:15 "	10	265
" 2037	7:42 "	9:09 "	10	223
" 1046	9:42 "	11:10 "	10	244
Total...21 trains.			191	12,401

From Philadelphia.

Train.	Leave Philadelphia.	Arrive Princeton.	Total cars.	Passengers.
Extra 3155	8:23 a.m.	9:48 a.m.	10	259
" 937	10:00 "	11:05 "	4	61§
" 3148	10:09 "	11:13 "	10	709
" 3158	10:26 "	11:45 "	12	473
" 2773	11:03 "	12:35 p.m.	12	683
" 2991	11:42 "	1:10 "	12	631
" 2992	11:56 "	1:20 "	10	174
Total... 7 trains.			70	2,990

From Princeton.

Train.	Leave Princeton.	Arrive Philadelphia.	Total cars.	Passengers.
Extra 184	4:06 p.m.	5:13 p.m.	10	659
" 551	4:13 "	5:30 "	12	460
" 1223	4:24 "	5:40 "	12	803
" 290	4:37 "	5:52 "	10	415
" 2217	4:45 "	6:57 "	12	670
" 937	5:12 "	6:34 "	4	64§
" 2215	5:40 "	7:02 "	10	539
Total... 7 trains.			70	3,610

From Trenton.

Extra 3155. Trenton, 12:10 p.m. Princeton, 12:54 p.m. 10 cars. 412 passengers. Returned on Philadelphia trains.

SUMMARY.

To Princeton.

From Jersey City	22	Special trains.	213 cars.	12,058 passengers.
" Jersey City	..	Regular "	.. "	495 "
" Philadelphia	7	Special "	70 "	2,990 "
" Philadelphia	..	Regular "	.. "	716 "
" Trenton	1	Special "	10 "	412 "
Total	30		293 "	16,671 "

From Princeton.

To Jersey City	21	Special trains.	191 cars.	12,401 passengers.
" Jersey City	..	Regular "	.. "	293 "
" Trenton				
" Philadelphia	7	Special "	70 "	3,610 "
" Philadelphia	..	Regular "	.. "	388 "
Total	28		261 "	16,692 "
Grand total...	58		554 "	33,363 "

*Yale team.
†Relief to regular train No. 81.
‡Newark and Elizabeth.
°New York Division Special.
§Pennsylvania R. R. officials.

STATEMENT OF TRAVEL TO NEW HAVEN, ACCOUNT YALE-HARVARD FOOTBALL GAME AT NEW HAVEN, NOV. 24TH, 1906.—NEW YORK, NEW HAVEN & HARTFORD.

To New Haven.

—Train—	From	Leaving time.	Arrive New Haven.	Equipment.	Passengers.
Extra 811.	New York.....	7:55 a.m.	9:55 a.m.	12 coaches.	349
" 830.	" "	9:00 "	11:00 "	12 "	819
" 831.	" "	9:25 "	11:20 "	12 "	834
" 835.	" "	9:50 "	11:47 "	12 "	740
" 819.	" " 10:04	"	11:34 "	5 coch, 2 parlr.	305
" 844.	" " 10:07	"	12:02 p.m.	12 coaches.	777
" 834.	" " 10:15	"	12:15 "	12 "	345
" 814.	" " 10:25	"	12:25 "	10 parlors.	448
" 842.	" " 10:30	"	12:17 "	10 "	349
" 829.	" " 10:35	"	12:30 "	10 "	263
" 843.	" " 10:43	"	12:33 "	12 coaches.	503
" 840.	" " 10:45	"	12:40 "	10 parlors.	271
" 818.	" " 10:52	"	12:45 "	10 "	377
" 836.	" " 11:08	"	1:02 "	10 "	226
" 1206.	Stamford	9:35 "	10:49 a.m.	10 coaches.	306
" 1205.	Stamford 10:50	"	11:55 "	10 "	646
" 1206.	Bridgeport ....12:32 p.m.		1:00 p.m.	10 "	473
" 804.	Boston	8:15 a.m.	12:20 "	10 parlors.	321
" 803.	"	8:20 "	12:27 "	10 "	291
" 806.	"	8:25 "	12:38 "	10 "	284
" 839.	"	8:35 "	12:52 "	12 coaches.	844
" 828.	"	8:40 "	12:57 "	12 "	183
" 1512.	"	8:30 "	12:30 "	5 "	325
" 1513.	"	8:32 "	12:47 "	5 "	427
" 1253.	"	8:01 "	12:04 "	7 "	335
" 1202.	Springfield. ...	9:25 "	11:20 "	10 ch, 1 private.	550
" 1250.	Hartford 10:20	"	11:44 "	10 coaches.	625
" 1212.	*B.& A., Spgfld.10:43	"	12:46 p.m.	9 "	464
" 1252.	Hartford 10:56	"	11:56 a.m.	10 "	475
" 1211.	*B.& A., Spgfld.11:24	"	1:07 p.m.	10 parlors.	252
" 813.	*B.& A., Spgfld.12:04 p.m.		1:33 "	9 "	295
" 1251.	Hartford 12:15	"	1:14 "	9 coaches.	265
Total for 32 trains					13,967

*From Boston, via Boston & Albany Railroad.

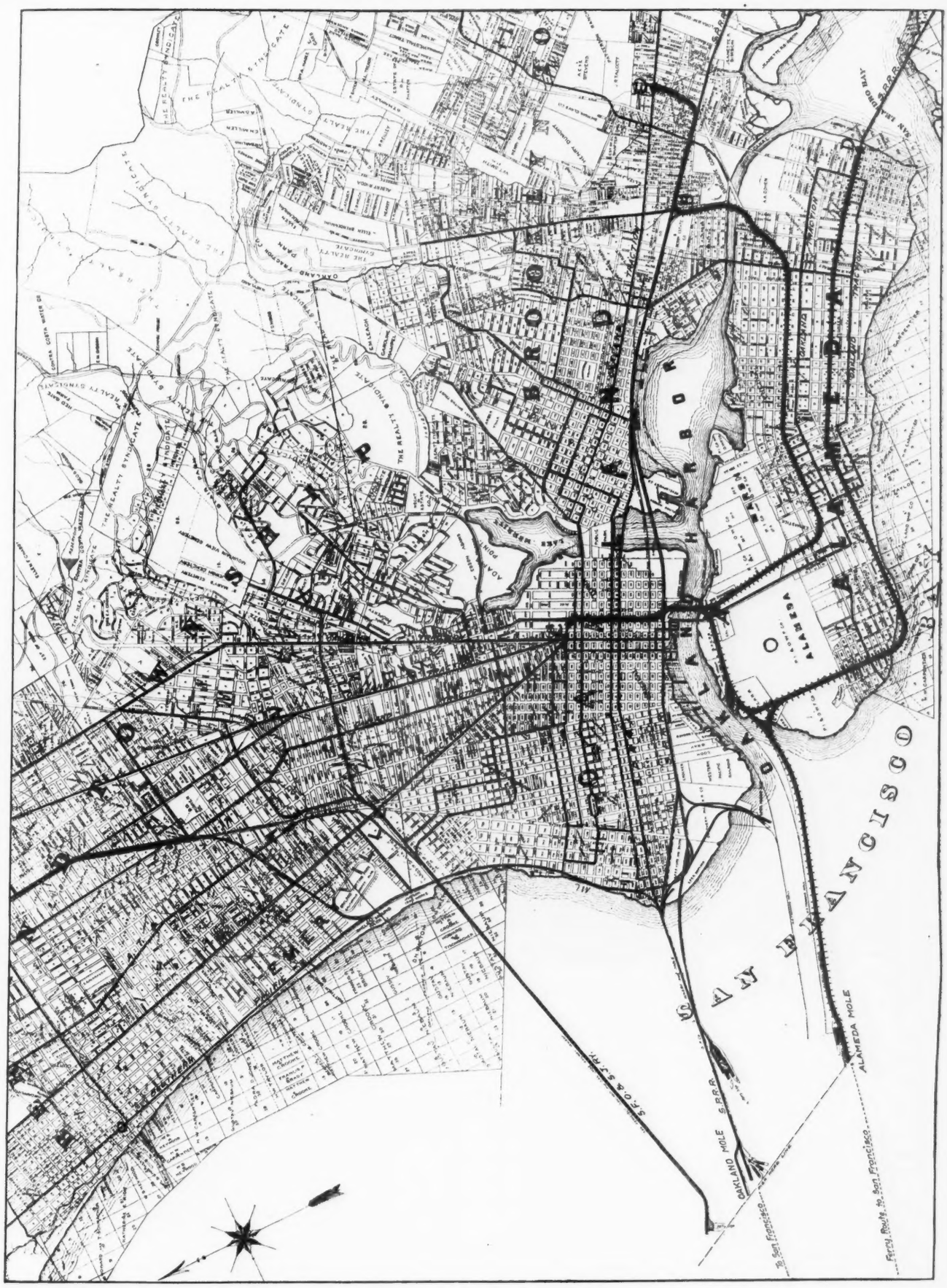
SUMMARY.

	Trains.	Cars.	Passengers.
New York Division—Through	14	151	6,606
New York Division—Local	3	30	1,425
Shore Line Division—Through	8	71	3,010
Hartford Division—Through	4	39	1,561
Hartford Division—Local	3	39	1,365
Total on Extra Trains.	32	330	13,967
Regular Trains to New Haven, 9 a.m. to 1:33 p.m....	28	..	7,561
Grand total, inbound, handled in 4 hrs. 33 mins.	60	..	21,528

Electrification of Southern Pacific Local Lines at Oakland.

Southern Pacific officials at San Francisco are now making active preparations to change about 20 miles of the company's local steam lines, extending from the ferry terminal to Alameda and Oakland into an electric railway. The plans recently received include the installation of an electric generating station at Alameda Point and the construction of an overhead trolley system. The present tracks will be utilized. An appropriation of $1,126,695 is understood to have been made for the work, which will probably require about a year to execute. All of the local lines converging at the company's Alameda Mole will be electrified. One of these extends to High street, Alameda, after branching off from the mole line. A second line crosses the Estuary and terminates at Fourteenth and Franklin streets, near the business center of Oakland. It is reported unofficially that the portion of this road now traversing Webster street will be moved one block further west and follow Franklin street. Also that an extension will be made so that this line will terminate at Twentieth and Franklin streets. The third division of the electric road will extend to Melrose via Alameda and Fruitvale. Heavy electric coaches, seating 84 passengers each, will be operated in solid trains, with 500-volt d.c. motors. It is not the present intention to do away entirely with steam local trains, which will be useful during the heavy rush hours of ferry traffic between San Francisco and suburban points.

The accompanying map shows the track arrangements at Oakland. It will be seen that the mileage is in the hands of four companies, the Southern Pacific, Santa Fe, San Francisco, Oakland &



Electrification of Southern Pacific Local Lines in Oakland, California.

Heavy cross-hatched line shows parts to be electrified immediately. A and B—New curves to be put in for electric lines. C—14th and Franklin Streets, Oakland terminal. D—Alameda, High Street terminal. E—Melrose terminal.

San Jose and Oakland Traction Consolidated. The last two operate by electricity. Apart from the traction company, the San Francisco, Oakland & San Jose, locally known as the Key Route, operates a 20-minute-interval ferry service between San Francisco, Berkeley, Piedmont and Oakland, and also 30 miles of connecting electric railway.

After completion of the electrification now on hand, it is understood that the Southern Pacific will continue it along the local lines extending through Oakland to Fruitvale and the line running via Sixteenth street station, Oakland, to Berkeley, with a branch to West Oakland. It is probable that the electric district on the coast will soon have the form of a horseshoe belt line operated around the bay from San Francisco to Oakland, via San Jose.

Shop Betterment Work on the Santa Fe.

BY CHARLES H. FRY,
Associate Editor of the *Railroad Gazette.*

II.

ROUNDHOUSE WORK.

As with the shop betterment work, improvement of the roundhouse situation was first undertaken at Topeka. The schedule of extension of the betterment work given at the beginning of this article shows the roundhouse work to have been begun in September, 1905, and system work to have been undertaken last April.

Complete schedules covering all operations in roundhouse work on all classes of locomotives were prepared by thorough time studies, involving an immense amount of detail work. The following items are taken at random from these schedules to indicate their general character; they also convey an idea of the great number of such items the schedules must necessarily include.

Sample Items from Roundhouse Schedule.

Subject.	Schedule No.	Description of work.	No. of men.	Classes of engs.	Time, hrs.
Wiping.....	0074	Wiping tank frame and trucks complete	1	All.	0.4
	0068	Wiping machinery below running board inside of frames, including engine trucks, &c.*	1	A B C D F U S T	0.6 1.0 0.8
Governor ...	0130	Overhauling air-pump governor complete	1	All.	0.5
Rocker boxes.	1244	Tightening rocker box.....	1	All.	0.3

*Including engine trucks, eccentrics, blades, straps, motion work and axles, inside surfaces of frames, rocker boxes, cylinders, saddles and brake rigging, also g uides, rods and cross-heads of balanced compound engines, lower parts of jackets, and all parts between frames not specified.

The letters in the next-to-last column for the second item refer to groups including certain classes of engines. The time given is in hours or fractions thereof. The wording and numbering of each schedule is common to all roundhouses on the System, which permits accurate comparison on all detail work between any and all points.

To permit greater elasticity in handling repairs—since roundhouse work necessitates more or less shifting of men and to permit the men to profit by such benefits as might be derived by carrying on several jobs at one time, a collective feature was introduced where the total work performed during any one day is grouped, and the total standard time of all operations taken as the standard time for the collective schedule, for the calculation of bonus.

Roundhouse expenses are divided into two classes: Handling expenses and repair costs. The handling expenses are classified into "direct" and "general"; the former including the wages of hostlers, wipers, boiler-washers, flue-borers, etc., and the latter, the wages of foremen, clerks, callers and sweepers. In comparing the handling expense at different points, the average cost per engine handled is not an accurate comparative basis, since more work is necessary on engines at one point than at another. To provide a more accurate method of comparison, a "unit allowance" for each of the 14 operations which may be performed in connection with the handling of engines at terminals was adopted, this unit allowance being equal to the cost of the operation in cents, as determined by the time studies. An engine is counted "handled" each time any one or more of these operations are performed. The total unit allowance for direct expenses is ascertained from a complete record of all these operations performed during a month at each point. A similar allowance for general expenses was arbitrarily fixed at 30 per cent. of the unit allowance for direct expenses. By dividing the total unit allowance into the total actual expense, a cost per 100 units of work is determined, and since the ideal cost is $1 per 100 units, this report forms an immediate basis for comparing the different roundhouses with their previous records and with other houses.

The effects of this system during the short time it has been in operation are indicated by figures taken from the January and September, 1906, reports on the Atchison proper:

	Total Engs. handled.	Total Cost.
January	24,627	$57,858
September	25,849	47,263

With a slight increase in total engines handled, there was a reduction in total handling cost for September of something over $10,000, or about 18 per cent., much of which is due to improved supervision. On the basis of the September results the yearly saving would amount to $120,000.

The bonus system is in operation at about 65 per cent. of the main roundhouses and the weekly reports from these points contain a summary showing:

The average number of men working on schedules.
The average number of men earning bonus.
Total work units.
Total wage cost.
Work unit efficiency (in per cent.).
Total bonus earned.
Per cent. of bonus.

The body of the report gives the figures for these items by days.

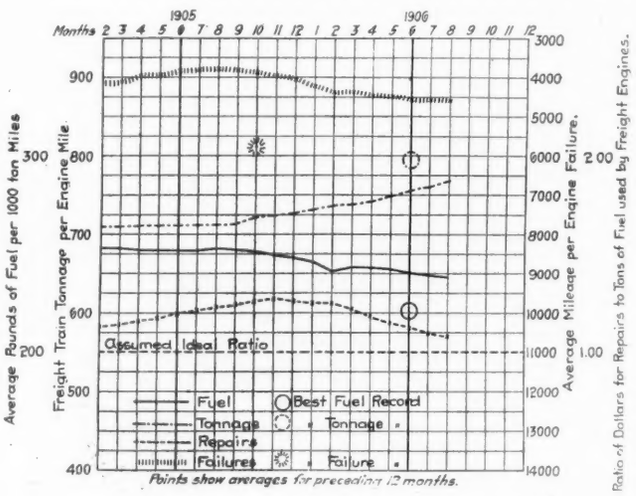


Fig. 8.

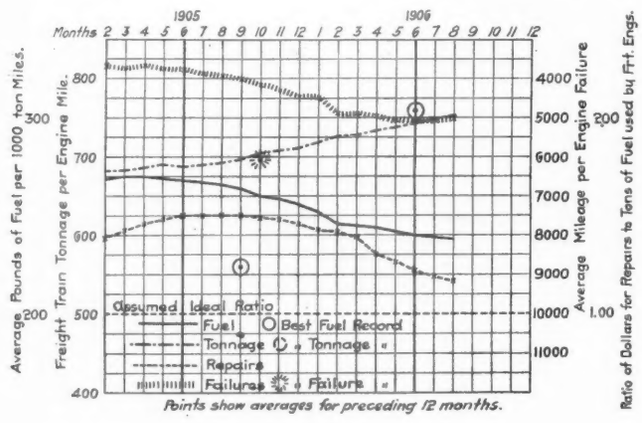


Fig. 7.

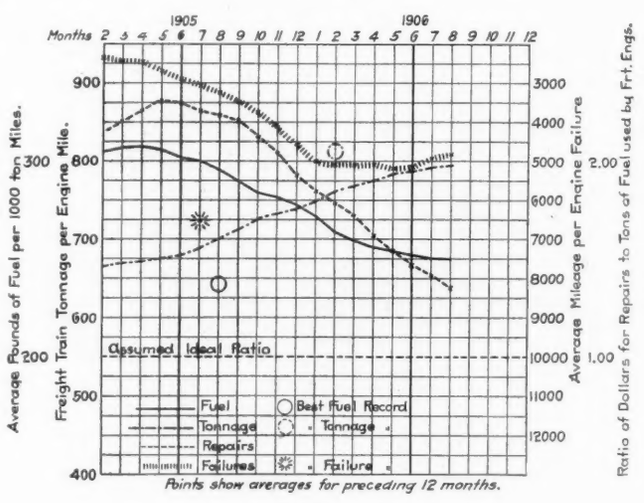


Fig. 9.

Figs. 7, 8, 9—Performance Graphs for the System, the Atchison Proper, and the Coast Lines, Respectively.

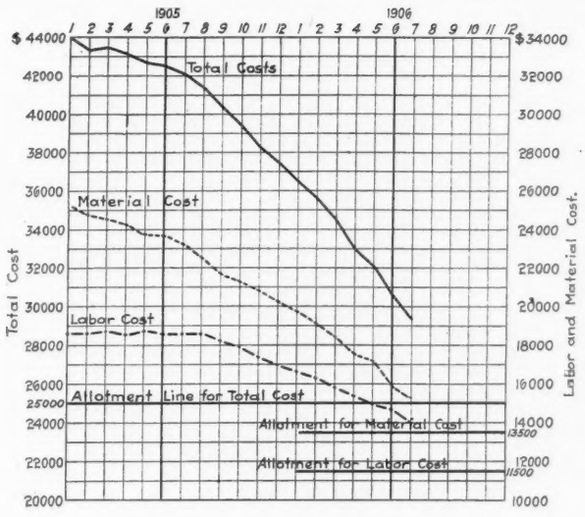


Fig. 10—System.

In handling the repair work, a system was adopted where an operation costing $1, when work is done in standard time, is established as a "work unit." Therefore, to determine the total work units a man delivers, the time-study or standard times for various operations are multiplied by his rate of pay. This, it will be understood, is regardless of the actual time taken for the work. Knowing the total work units delivered by a man and the total wage cost, his work unit efficiency may be determined. For 100 per cent. efficiency—that is, where the work units equal the wage cost—the bonus rate is 20 per cent. Greater or lesser efficiencies are bonused, relative to the standard, in the same proportion as in the shop reward system.

In one respect the roundhouse bonus system differs materially from the shop system, and that is in the payment for overtime. In the shop work all bonus schedules lapse where overtime is paid, the purpose being to eliminate overtime work completely. This is based on the theory that working men overtime results in an actual loss in efficiency and less is accomplished in the end than when their efforts are confined to regular hours only. But in the roundhouse this would work a hardship in many cases. Work here cannot always be confined to regular hours, it often being imperative to carry it to completion without delay, in order that the power may not be unduly detained from service. Under the shop provision, if a man worked six hours on a job, five of which were regular time and only one hour of overtime, he would forfeit all of the bonus he may have earned in the first five hours. This feature was therefore modified in the roundhouse system to allow bonus for the full time worked. However, if a job is begun on overtime, the right to bonus

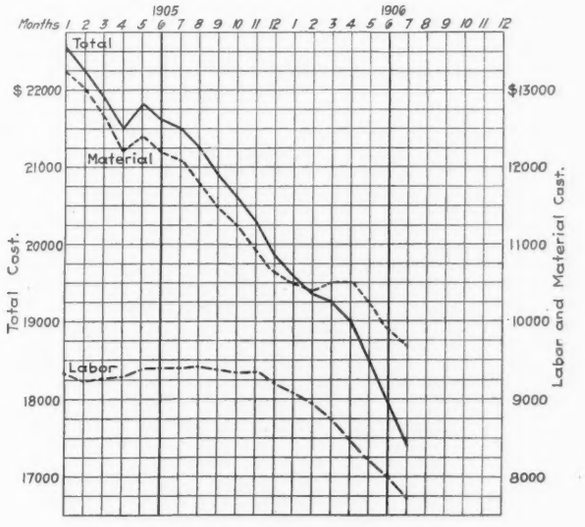


Fig. 11—Atchison, Proper.

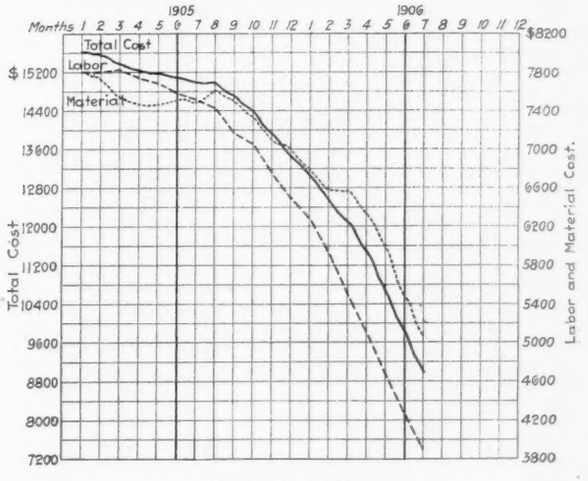


Fig. 13—Coast Lines.

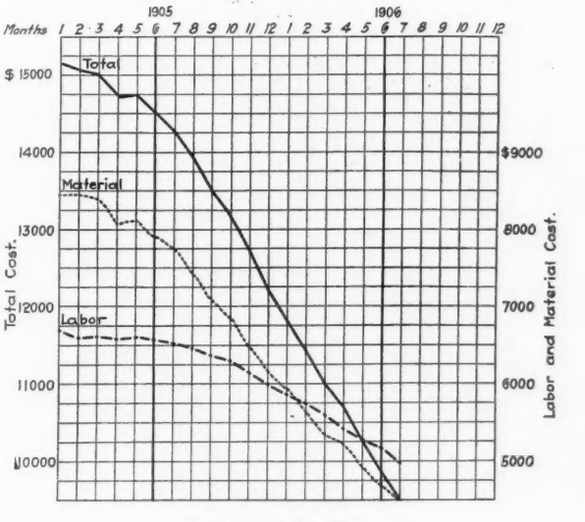


Fig. 12—Topeka Shops.

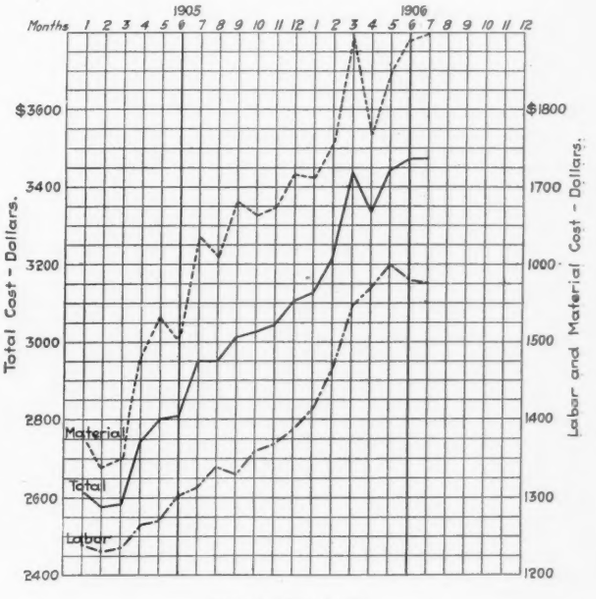


Fig. 14—Gulf Lines.

Figs. 10-14—Graphic Representation of Expense of Shop Machinery and Tools.

is forfeited. This is to minimize the amount of overtime work done, reducing it to what is only actually necessary.

POWER HOUSE WORK.

The work on power house economies has been limited to efforts to stop leaks; or, in other words, to secure the most economical conditions of operation possible with existing equipment. To improve the fuel record, power house engineers are bonused on coal consumption, the system being similar to that used in rewarding engine crews for like savings.

CAR WORK.

Car work has only just been taken up, the time given in the schedule of extension of the work being August of this year. Little can therefore be said regarding it at this time beyond its general character. In this respect it will be similar to the roundhouse system, with similar schedules and method of bonusing.

ECONOMIC RESULTS OF THE BETTERMENT WORK.

The final and decisive test of the worth of the betterment efforts is the effect on the operating expense accounts, of course. An intimation of the effects in this respect was given in the early part of the article where it was stated that "for every dollar of supervising and special expense incurred, the company has saved at least $10 in reduced costs." The figures which are presented below are based on the last annual report of the company for the fiscal year ending June 30, 1906. Certain facts should be known and borne in mind in considering them and the graphical representations of performances, etc., also included.

During the fiscal year mentioned the work was limited to Account 12 (repairs and renewals of locomotives), principally the labor part of it; to supervision; to Account 17 (repairs and renewals of shop machinery and tools), and to roundhouse work. Also the full effects of what this work was able to accomplish were not realized until toward the end of the year; for the beginnings were always small, of course, therefore the total saving distributed over the year would make the average monthly saving much less than was actually being obtained in the closing months; besides, much of the work was not started until the year was half gone, or more. Furthermore, all graphical records presented are based on twelve-months' averages; that is, the figure for any month is the monthly average for the twelve months ending with the month in question. Therefore, maximum results would not show fully in such diagrams until they had been realized for an entire year.

System results include figures for all points, of course. As the betterment work was active only in certain districts or at certain points, and only in certain accounts, its good effects in the System results must bear the burden of any increased expense and adverse conditions in territories and accounts where it is not yet in effect. For example, in maintenance of equipment, those accounts in which it was active showed marked reductions, while those in which it was not active advanced materially, due in many cases to increase of traffic. In transportation accounts, all showed an increase for the year except the one touched by the work, namely, fuel. Territorially, like differences were noticeable. The betterment forces were active on the Atchison proper and on the Coast Lines, but not on the Gulf Lines, except as to fuel. On the last-named lines there was a marked increase in locomotive repair expenses, but a reduction in fuel account. The tool account betterment was accomplished practically at four points, where a reduction of more than 50 per cent. was secured; all other points, almost without exception, showed increases. As already mentioned, the following figures are taken from the last annual report:

Saving on Locomotive Basis.

	1904-5.		1905-6.
Total number of locomotives, June 30	1,454		1,633
Reduction in cost per engine, including all renewals, distributed and adjusted charges		$1,064	
Total economy on 1,633 locomotives		1,737,626	
Average locomotives in service	1,447		1,550
Reduction in cost per locomotive, as above		$918	
Total economy		1,423,132	
Reduction in actual charges for repairs only, Acct. 12 (locomotives) and Acct. 17 (tools and shop machinery)		795½	
Total economy		$1,233,009	

This last figure is based on locomotives actually in service, and with the exception of maintenance of shop machinery and tools, does not include renewals, supervision, boiler service or other adjusted and distributed expenses.

Although new locomotives were added in 1905-6, the mileage per locomotive was maintained.

Saving on Mileage Basis.

	1904-5	1905-6	Increase.	Per cent.
Locomotive miles	40,727,636	45,694,524	4,966,888	12.2
Miles per locomotive	28,011	27,982		

Direct reduction of cost per engine mile, not including renewals or distributed accounts:

Labor	$0.0225
Material	0.0068
Total, Account 12	$0.0293
Account 17	0.00386
Total reduction	$0.03316

Had the cost per mile been as high as in 1904-5 the additional cost would have been:

For Account 12	$1,338,850
For Account 17	176,809
	$1,515,659

$353,219, part of which is due to the betterment work.

Fuel Basis.

It is assumed that repairs properly are proportional to fuel used.

	1904-5.	1905-6.
Tons of fuel	2,784,245	3,108,000

Saving on basis of 1904-5:

Locomotive repairs (Account 12)	$1,308,650
Tool account (Account 17)	155,400
	$1,464,050

Tons on Drivers Basis.

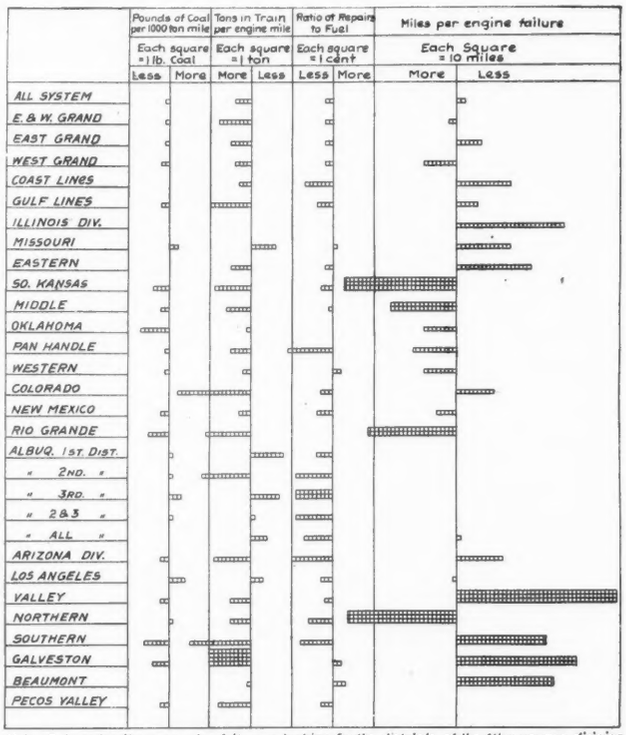
	1904-5.	1905-6.
Tons on drivers	85,421	100,054

Saving on basis of 1904-5:

Locomotive repairs (Account 12)	$1,591,859
Tool account (Account 17)	202,109
	$1,793,968

Road Unit Basis.

"Road units" are obtained by multiplying a locomotive's mileage



Note: Data as to miles per engine failure is lacking for the districts of the Albuquerque division and the Pecos Valley Lines. Otherwise the absence of blocks indicates no change from record for preceding twelve month period.

Fig. 15—Combined Comparative Monthly Showing, August Against July, 1906 (Twelve Months' Averages).

by its weight on drivers in pounds, and dividing the product by 100,000,000; or

$$\frac{\text{mileage} \times \text{wgt. on drivers (lbs.)}}{100{,}000{,}000}$$

	1904-5.	1905-6.
Total road units	47,855	56,301
Road unit cost	$106	$78

Saving on basis of 1904-5:

Locomotive repairs (Account 12)	$1,618,091
Tool account (Account 17)	204,936
	$1,823,027

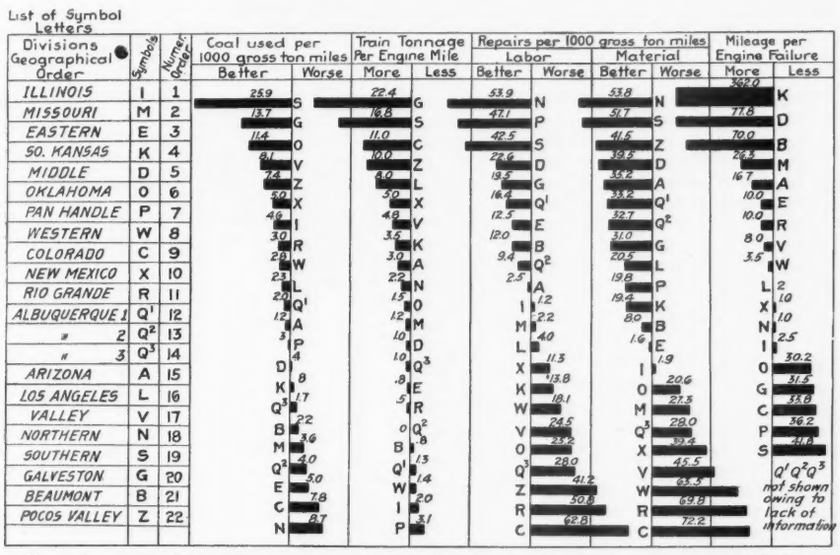
Performance diagrams or graphs are presented herewith showing the average pounds of fuel per 1,000 ton miles; the freight train tonnage per engine mile; the average mileage per engine failure, and the ratio of dollars for repairs to tons of fuel used by freight engines, all on a basis of 12 months' averages (Figs. 7, 8 and 9). Such records are kept not only for the System and all of its grand divisions, but for each division and district of the latter, there being 31 graphs in all. The records here shown extend from February, 1905, to and including August, 1906. Being based on 12 months' averages, the point indicating any month's performance is the average for the preceding 12 months. Examination of the System graph,

Fig. 7, discloses uniform improvement in all four records. The average fuel consumption per 1,000 ton miles has dropped from 264.5 lbs. to 249.5 lbs. The circle represents the best performance in this respect ever obtained in any single month, and, therefore, supplies an ideal or standard for which to strive. This figure is 222 lbs. and gratifying progress has been made in its direction.

The freight train tonnage per engine mile has steadily increased and has practically attained the standard represented by the best single month's record—the broken-line circle on the 1906 line. The increased tonnage performance is attributed to improved locomotive conditions, more miles being got out of the engines and more tonnage per engine mile. These improved locomotive conditions are due to the bettered roundhouse methods and to improved supervision by the road foremen of engines.

The best failure record ever obtained was approximately 6,000 miles. The average record has been raised from 3,700 miles to slightly over 5,000 miles in the 18 months covered by the graph.

The fourth curve, representing the ratio of dollars for repairs to tons of fuel used by freight engines, furnishes a new basis for making comparisons of performances and is considered much more rational and therefore much superior to the ton-mile basis. As a locomotive is a machine for converting the energy of coal into work at the drawbar, it is evident that work done should vary directly with coal burned. Repairs should vary with work done. Therefore, dollars of repairs per ton of coal used gives a unit of comparison in which variation of grades, speed, etc., can be ignored. The coal used on mountain divisions is greater than that used on the plains. The repairs are also greater, but the work done is likewise greater and the ratio of dollars of repairs to tons of fuel remains surprisingly constant. This ratio, therefore, allows comparisons of every sort to be made, such as between various divisions quite unlike in physical characteristics, between passenger and freight locomotives, etc. As will be observed on the diagram, an ideal ratio has been assumed, this ideal allowing $1 of repairs for each ton of fuel used. The proximity of the advancing end of the performance curve to the line representing this ideal will be noted.



Blocks show comparision with preceding month, not standing of divisions. Letters at end of blocks are symbols of divisions as shown in the list at the left.

Fig. 16—Comparative Standing of Each Division With Respect to Its Previous Month's Performance, on a Percentage Basis—August, 1906.

Figs. 10 to 14, inclusive, are graphs of the shop machinery and tools account for the System and some of the major divisions, for 19 months. Reference has already been made to the actual money saving on this account and to the fact that the result was obtained almost wholly at four shops—Topeka, Albuquerque, The Needles and San Bernardino. The figures previously given appear graphically in Fig. 10, the System graph. The monthly average total cost for 12 months ending with January, 1905, was $44,000. For a like period ending with July, 1906, the last entry on the graph, the figure is $29,200. As already mentioned, it has since been brought down to the ideal allotment of $25,000. Labor and material costs are shown separately, the scale for their values being given on the right-hand side of the figure. The ideal labor cost allotment it will be seen is $11,500 and the material cost $13,500. Fig. 11, for the Atchison proper, corresponds in general character with the System graph. Yet it is interesting to know that this condition is imparted largely by the results at Topeka shops (Fig. 12), as the curves of the graphs for the Eastern and Western Grand divisions, which do not include these shops, exhibit an upward tendency. Some of the individual divisions of these two districts show decided and uniform improvement, however, while others exhibit just the reverse condition.

Three of the four points mentioned above as the ones at which the improvement in this account was mostly achieved, are on the Coast Lines, explaining the decided drop in their curves during the last 12 months of the record, Fig. 13. In contrast with the four preceding graphs, Fig. 14 is presented to show the situation on the only grand division where no work at all was done on Account 17. It represents the Gulf Lines.

In speaking of the work done in Mr. Emerson's office, it was stated that records of pay-rolls, engine repairs, engine mileage, engine fuel consumption, engine supplies, tool and machinery repairs, car detentions and repairs, etc., are sent here regularly to be tabulated and graphed to show promptly and in the plainest manner the general tendency over the whole System, enabling a comprehensive bird's-eye view of maintenance, shop, engine, car, fuel and supply conditions of the System, as well as of each individual point, to be gained almost at a glance. Samples of such graphs are exhibited in Figs. 15 and 16. They compare performances for consecutive months, the two in question being July and August, 1906. The items covered are given in the respective column headings, and every division on the System is listed. Fig. 16 simply arranges on a percentage basis and in the order of their magnitude the results exhibited in Fig. 15, the figures above the blocks in the former being the percentages. This arrangement necessitates the use of symbol letters to identify the various blocks, each representing the performance on a division. A list of the divisions with their symbol letters is given in connection with the figure. In Fig. 15 it will be noted that some of the blocks are thicker than others. This was because of lack of room to give the higher values their proper relative length. In such cases the volume of the block is the measure of its value; that is, doubling the height, or thickness, is equivalent to doubling the length.

In conclusion it should be stated that throughout the work it has constantly been borne in mind that in railroad operation efficiency is more important than economy, and when any question arose in which there was even a remote possibility of impairment of efficiency, economy was postponed. Nothing was said in discussing the individual effort reward system regarding possible reductions in force as a result of the improved efficiency of the men. When the bonus stimulus makes possible such reductions, they can be effected simply by not replacing men who naturally drop out. This has been the policy in connection with the Santa Fe work, so that there has been no ground for objection by employees on that score. The betterment organization will ultimately be absorbed into the regular organization, such absorption being even now in process, where the work has reached a stage making this desirable. The comparative slowness of the general introduction of the work on the System is due to the two-fold condition of working only through the regular officials, and of not attempting economy where there seemed a possibility of impairing efficiency.

Relations of the Engineer to Sociey.*

BY HENRY G. PROUT.

It is my constant observation of four engineering works, employing about 20,000 men, that engineers reach the limit of their usefulness from defects of character, rather than from want of technical attainments. Our greatest difficulty is to find courage, candor, imagination, large vision and high ambition. I do not know which of these qualities is most often lacking, or which is most essential. The lack of courage and candor comes most often to my notice, but the lack of imagination and of broad outlook produces the most serious disasters. All of these things an engineer must have if he is to go far in the work of life. Our scheme of education will be radicallly defective if it does not provide for the development of courage and candor of imagination and broad vision and high ambition. Our scheme of education of the engineer and the citizen must also teach our youth something of the large mistakes of men and nations in the past and something of their successes. Lacking that teaching we see the farmer in Texas and the third-rate lawyer in

*Abstract of an address by Henry G. Prout, Vice-President and General Manager of the Union Switch & Signal Company. Colonel Prout was for many years Editor of the *Railroad Gazette*.

Congress and the professional friend of mankind in Nebraska reinventing ancient errors and diverting valuable energy from the useful purpose of hoeing corn.

This brings me to another suggestion. Gen. Gordon used to say that it would be better if the young British officers were made to read Plutarch's Lives. "There we see men of no true belief, men who are pure pagans making their lives a sacrifice as a matter of course. In our day it is highest merit not to run away." This is a fertile suggestion under which lies a truth of the greatest importance in the scheme of education. At this moment we may see Plutarch's men fighting for their country on the other side of the world and showing noble devotion and a lofty idealism, because for centuries and centuries great ideals have been held always before them. Admiral Togo's little address to the spirits of the dead the other day in Tokio was a noble inspiration to the youth of his nation. It had the very spirit which made Plutarch's men immortal. The essential thing is to bring youth into habitual and constant contact with great men and great ideas and great deeds. Make them read Huxley's Life and Letters and Lord Robert's Forty-one Years in India and Grant's Memoirs. Or, perhaps better than any of these, let them read deeply in the story of Lincoln's life. There they will find the simple foundation qualities, love of truth, courage, patience and fortitude, tenacity and devotion, working in great fields of effort. If these examples do not stir a young man, you had better let him go quietly back to hoeing corn. He may make a useful man and a necessary man, but he cannot make a great man or even a big man. Huxley has said that the progress of mankind has been through the production of men of genius; but society cannot deliberately and conscientiously produce men of genius. They are the rare fruit of a thousand uncontrollable conditions, but we can deliberately and consciously develop leaders, and the affairs of men have never called for leaders so loudly as now.

It is my proposition that the engineer more than any other man has brought about the new epoch which we have now entered upon, and that he more than any other man is to lead mankind forward in the next century or two. But who is this engineer to whom we assign such a place in human progress? What is engineering? These claims, so broad as to seem extravagant, must rest on a broad foundation.

Some eighty years ago Tredgold made that famous definition of engineering which has never been improved upon. It is the art of directing the great sources of power in Nature to the use and convenience of man. Broadly this definition must include the physicist, the chemist, the biologist, the geologist and the metallurgist, for they discover those laws and properties of matter in the knowledge of which the engineer must work. Narrowly the engineer is one who, having knowledge of the laws and properties of matter, designs and constructs. The primitive engineer, the man who had that instinctive feeling for the forces of nature and for the properties of matter, and that quality of contrivance which must be born in a man if he is to be an engineer at all, taught his fellow savages to use fire, to use bows and arrows and to make pottery. Then he taught his fellow barbarians to use the strength of the larger animals and to smelt and forge iron. Just so the modern engineer using the same heaven-sent qualities is carrying forward the conquest of nature until he has brought us into this last and greatest era, the era of the manufacture of power.

I shall not stop to name his doings, they are written across the face of the earth. You remember what Carlyle says of the English, "Of all nations the English are the stupidest in speech, the wisest in action. Thy epic, unsung in words, is written in huge characters on the face of this planet—Sea-moles, railways, fleets and cities, Indian Empires, Americas, legible throughout the solar system, England her mark." Such, too, is the epic of the engineer written in railways, canals and bridges, in fleets and harbors, in water works, roads and parks, and finally in the great ultimate struggles of mankind on the battlefield to save and destroy nations. There, too, the engineer writes his tragic poetry. You never thought of him as a poet, did you? and yet in the last one hundred years the highest expressions of the creative imagination have been in the work of the engineer.

A few years ago Mr. Abram S. Hewitt said that Sir Henry Bessemer had done more than any other man of his time to destroy the power of the privileged classes in Great Britain; that he was the great apostle of democracy. Bessemer's service to mankind was to lower the cost and increase the quantity of steel and so make possible the enormous development of transportation in the last half of the last century, which has changed the face of society, and I do not believe Mr. Hewitt over-estimated the importance of Sir Henry Bessemer's achievement. The wheat that makes a loaf of bread is carried from Dakota to New York for one-third of a cent. One day's wages of a mechanic will carry from Chicago to Liverpool food to last him a year. Quick transportation has cut the peasant loose from the soil of his little parish and opened the markets of the whole world for the labor of the artisan. All this means that improvement in transportation has been one of the powerful forces for preserving and spreading liberty. Thus Bessemer was the apostle of democracy. The engineer has made life freer and easier, he has helped to destroy arbitrary class distinctions, and he has prolonged human life.

I shall not dwell longer on what the engineer has done. I wish especially to take a little time to point out some of the things which he is about to do. Bear in mind that in what I shall say I use the term "engineer" in its broadest sense to indicate the man of modern scientific education and of practical contrivance. Trained in daily contact with exact and inexorable laws he is becoming more and more a leader in large affairs, he is fast taking his place at the head, and close to the head, of the great industrial concerns. Mind I do not say that he will displace men of other professions. Men bred to the law, men trained in business, will always rise to the top. Superior men will make their way to command through many different avenues. What I do mean to say is that the education and experience of an engineer especiallly fit him for high administrative positions not now commonly thought of as engineering work. Carlyle tells us that "Frederick the Great's ambassadors are oftenest soldiers. Bred soldiers, he finds, if they happen to have natural intelligence, are the fittest for all kinds of work." In Frederick's time engineering as a profession did not exist. Soldiering came nearest to it, and there is great likeness in the work of the engineer and the soldier, and in the qualities of mind and character developed in the two callings. Both must ascertain physical facts without mistake. Buth must analyze and weigh evidence and must reason correctly. Both must deal with relations of time, space, force and matter. Both must handle men in action. Both must have the restrained and disciplined imagination to project clearly conditions and results which they cannot see. Both must decide, often very quickly, knowing that on the decision hangs success or failure. But this is the training which makes men of action—leaders, commanders. No doubt you will agree with much that I have just said, but I question if you will appreciate the gravity of the sudden emergency work which comes in an engineer's life.

Suppose you are putting down a deep foundation alongside of a twelve story building in New York City and the quicksand begins to run and the walls of the big building to crack. The peril is not so pressing as the peril of battle, for you can stop work and think. But you must think straight and act right, or you will cost someone a lot of money, even if you kill no one. Suppose you are putting in a foundation for a bridge pier in the bottom of the Mississippi and the river bed begins to scour and a caisson as big as a house begins to tip and to move down stream. A great deal of money depends on what you do in the next few hours. Suppose you are putting a tunnel under the St. Clair river and the compressed air begins to blow out through a pocket in the river bed. Here is an affair of minutes and of life as well as money. These very things have happened and are exactly the things that come as a matter of course in an engineer's life, and they are met by just the same qualities of courage and stored up skill and emergency judgment that you must have ready when the enemy gets on your flank. Beyond all this the engineer is of necessity a student of costs and economics. He must know what it costs to move a yard of earth and to put in a yard of concrete and why. He must know what it costs to produce a horse-power. He has been defined as a man who can do well for a dollar what any man can do somehow for ten dollars. Beneath all this must lie sleepless fidelity to his trust.

These are some of the qualities of leadership, obvious, and recognized as produced in the contest with nature; but there are others, higher ones, not so obvious. I mean the qualities of moral leadership. The engineer can have no object in concealing the truth or in misusing it. His work is a material fact; it is not an impression on the minds of other men. No trick of words, no art of speech, will make his bridge stand up, or his bearings run cool. No ingenuity of argument, no power of rhetoric will save one ounce of coal per horse-power hour. We all know in some vague and abstract way that we must yoke our wagon to a star; but the engineer must do it. The law which guides him is not the product of the schools and the courts, it is not the product of changing standards of life and thought; it is the eternal law of nature. So far as he finds it and follows it he succeeds; so far as he misses it he fails, and there is no escape for him. Nature always stands watching him, neither kind nor cruel, but perfectly just—swift, inexorable and inevitable—at once his guide and his judge. Who else of all mankind has a discipline so fine? Reward is so prompt, punishment is so swift and sure. Emerson has said—"The mind that is parallel with the laws of nature will be strong with their strength."

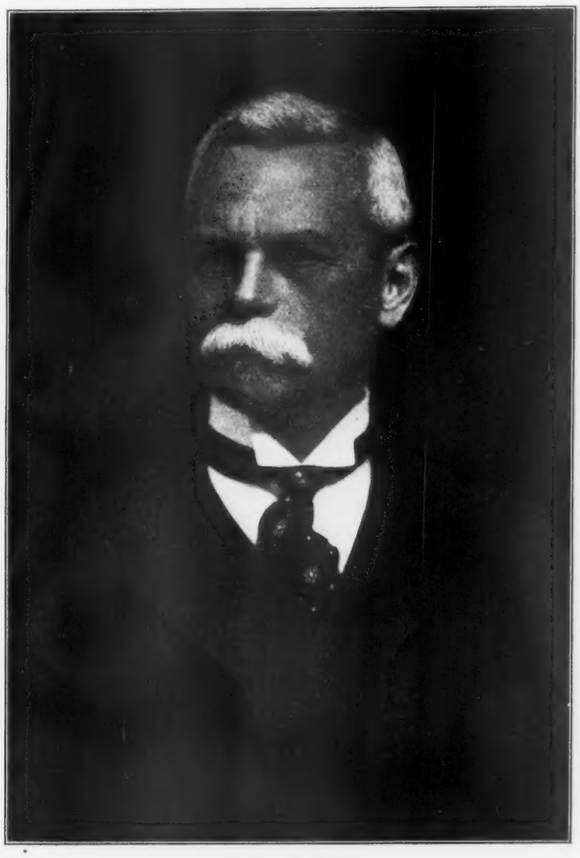
I have pointed out some of the special and peculiar qualifications of the engineer for leadership. My real purpose has been to call attention to the commanding importance in the advancement of mankind of a certain sort of training. If we are to help mankind forward in the new era on which we have entered we must gain positive knowledge, and we must vitalize it by contact with great characters and great events. We must get command of the sources of power in nature and then within ourselves, we must have courage and candor, fortitude, tenacity and imagination, and devotion; and the greatest quality of all is devotion.

Samuel Spencer.

To the soil of Virginia, not far from his Alma Mater, on the railroad that had been his charge in early manhood, and an integral part of the system welded together by him in his maturity, Samuel Spencer almost literally yielded his ashes on Thanksgiving morning. On the day that the Nation lifted its voice in gratitude for the manifold blessings of its civilization, he was killed by the instrument he had almost created and had developed to diffuse those blessings, and enhance that civilization throughout the region of his birth, to whose welfare his devotion was unceasing.

The fine old strain of the Spencers and of the Harrisons—the family that has given a signer to the Declaration of Independence and two Presidents to the United States—were blended in this man who graduated at the head of his class at the University of Georgia, and at the head of his class when he completed a subsequent course at the University of Virginia.

He had chosen a course in civil engineering, thus displaying the foresight that marked his career; although but a lad of 18 at the close of the war he saw that railroads were needed, and he thereupon fitted himself to build them. After three years of field service in construction he perceived that there would be a crying need for men to run the railroads that were extending far and wide, and he beset himself to learn the detail of operation. In this he became proficient through seven years of service, as a clerk in the office of the Superintendent of the New Jersey Southern, Assistant Supervisor of Trains, and Supervisor of Trains of the Baltimore & Ohio, Superintendent of Transportation of the Virginia Midland, and General Superintendent of the Long Island Railroad. He never had a friend at court but his promotion was invariably rapid.



Samuel Spencer.

After Spencer had left his service, John W. Garrett, the President of the Baltimore & Ohio, discovered that he had lost a good man, and finally, in 1879, persuaded him to return as Assistant to the President. In this position his experience broadened. Mr. Garrett, who had gained in years and lost in vigor, allowed his clear-headed and indefatigable assistant to unravel problems in traffic and accounts, as well as in construction and operation. A conspicuous achievement was the straightening out of the operation of the Trans-Ohio lines, of which he was made Acting General Manager for that purpose. Before long the actual practical administration of the Baltimore & Ohio fell to him. This condition continued during the administration of Robert Garrett, who gave his attention to the extension to Philadelphia and to the projects for entering New York. With these Mr. Spencer had little or no connection, but he was the virtual head of the existent Baltimore & Ohio system. In 1887 the financial interests that desired to conserve the property insisted that he be made the actual President. While in this position he sought to perform a long-needed surgical operation upon the company's accounts. The valuation of its assets on the books had long been grossly in excess of a reasonable appraisal. Cars and locomotives had been destroyed, and were placed out of commission for one reason or another, without being replaced; docks and wharves had worn out; money had been lost in branch lines, but no deduction had been made from the valuation, nor had allowance ever been made for depreciation. The cut that Mr. Spencer made was not nearly so radical as the circumstances demanded, but it wounded the pride of the majority stockholders, who were devoted to the memory of the Garrett regime, and he was not re-elected. Mr. Spencer's attitude was based upon clear perception of and invincible courage in facing the facts. Had it been accepted, the next few years in the history of the B. & O. might have been of steady recuperation, instead of the deepening disaster that led to the receivership.

Mr. Spencer's services were immediately enlisted by Drexel, Morgan & Company (the firm now designated as J. P. Morgan & Company). Their investments in railroads and railroad securities were extending, and they needed the guidance of a man expert in all that pertained to railroads. Thus Mr. Spencer's courage and ability were given opportunity in a still broader field. He had to arrive at the status of this railroad and that railroad in different parts of the country, of different construction, beset with varying traffic problems, and serving communities of different characteristics. He had learned what constituted good construction, good operation and good direct administration, and now, through more immediate contact than before with financial problems, he developed the capacity to look at a railroad from the standpoint of the investor; he learned what was necessary to a presentation and how to make the presentation that would command respect in the banking capitals. Incidental to his connection with the Morgans, he regenerated and revivified several poorly built and badly conducted railroad properties, and at the same time on behalf of the City of New York, gave much attention to the Rapid Transit Commission, of which he was a member from 1891 to 1893, and as a member of the Brooklyn Bridge Commission helped to design the present terminal structures, which doubled the capacity of the bridge.

In 1893 came the event which led to the crowning achievement of his career—his appointment as Receiver of the Richmond & Danville, and of the East Tennessee, Virginia & Georgia railroads. His extraordinary experience, together with his thorough knowledge of the South, led to the inception of the plan whereunder a number of the southern railroads that had separately struggled along to bankruptcy, could be united in a mutually co-ordinating system. Thus arose the Southern Railway Company, of which he became President. Bit by bit the system extended until it formed a channel for every important traffic current of the South, its lines reaching from the great cities of the seaboard throughout the Southern Atlantic States to Florida; through Atlanta to Memphis and New Orleans; from Cincinnati and St. Louis to the Gulf, and to the southeast. This bringing together of separate railroads required great care and patience; but the principal obstacle to successful operation was the run down condition of the roads and their equipment. The desolation wrought by the war had not been repaired before the depression of the panic of 1873, and the panic of 1893 fell with distressing severity upon the South. The Southern Railway was obliged to demonstrate its ability to exist before investors would entrust their funds with the company. Year by year it struggled along, rebuilding track and structures and providing new equipment as rapidly as earnings would allow. Then came the great revival of industrial and commercial activity. The demands upon the railroads all over the United States greatly overtaxed their capacity; there were not tracks enough, nor equipment enough, and trained and skilled employees in adequate number could not be obtained. These conditions were aggravated in the South, which entered upon an era of growth exceeding in ratio that of the more regularly developed regions. The Southern Railway Company continued to meet the conditions as best it could. Its earning capacity was finally thoroughly established; a bond issue of $200,000,000 was authorized at the beginning of this year. The proceeds of this issue will permit the practical rebuilding of the system. The main lines, however, are well built, well equipped and well operated at this time, the delays not being incommensurate with those on other railroads that have likewise been overwhelmed with the marvelous and continually increasing volume of traffic. At this writing there is nothing to show that the cause of the wreck was other than an error of an operator at a block signal tower. Unexpected flaws in the working of the human brain cannot be eliminated even by the most careful railroad management, any more than can the coming to light of unexpected and undetectable flaws in material and structure.

In the relations of the administration of a railroad company to its employees, Mr. Spencer was thoroughly grounded during the earlier years of his career; into its relations to the investing public

he gained a complete insight while with J. P. Morgan & Company, and during that period his eyes began to be opened to another relation of paramount importance, to the elucidation and cultivation of which the railroad presidents as a whole had given but little attention; that is, the relation to the general public considered not as shippers or consumers, but as the power behind the government.

That there have been abuses in railroad administration has been widely known and admitted by no one more freely than by Mr. Spencer. The actual abuses are insignificant beside the excellence of that administration in general and its beneficent results as a whole is not so widely known, nor freely admitted by all of those who know. That the clamor of recent years against the railroads has sprung largely from ignorance of the principles underlying railroad practice, and has been fomented by those desiring an increase of political power; those who have not adjusted their affairs to the changing economic currents, and those whose vague discontent with existing conditions, leads them, without analysis, to attack whatever confronts them. All this Mr. Spencer knew, and he realized what the ultimate consequences will be if the cause of the railroads is not made clear to the popular understanding.

To the presentation of this cause he freely gave his pen and his voice. His style of expression was as was the man—simple, direct, vigorous, comprehensive in sweep, but of concentrated lucidity. When the agitation for additional railroad legislation resulted in the passage by the House of Representatives of the Esch-Townsend bill in the spring of 1905, the presidents of the railroads, alarmed at last by the proposal to give unrestricted authority to make railroad rates and to determine railroad practices for the entire country to a body of five men sitting in Washington, asked Mr. Spencer to act as their spokesman and representative. In the following year he gave to this mission much of his time and energy. The inherent fairness of his mental processes, the vigor of his thought and expression, and his transparent sincerity are indicated by this oft-quoted extract from his address before the Traffic Club of Pittsburg, April 7, 1905:

"Strengthen the laws in condemnation of rebates, secret devices and unjust discrimination to any extent that may be found possible, and provide, if such further provision be still necessary, for the prompt arraignment and prosecution of all offenders of the law in the duly constituted courts of the country, and for the unsparing punishment of those who are found to be guilty. If there are such offenders in the railroad fraternity, their offences should be exposed and punished, but it is un-American and unfair, not to say outrageous, because it is alleged there are such, that every manager, and every president and director, shall be subject to indiscriminate public condemnation, and that the innocent investors shall have their property jeopardized, and their rights infringed, because those to whom the prosecution of the law is entrusted fail to find the offender, and to punish him."

It is noteworthy that prior to this clarion proclaim there had not been a single prosecution of any railroad for rebate giving, although the Elkins law had been in effect for two years; but since its utterance the Federal government, that had been crying for more law, began to enforce the law then existent, under which, during the last year and a half have been conducted the prosecutions and imposed the penalties for rebate giving.

In his last public address, which was delivered before the Agricultural Association of Alabama, at Montgomery, on October 25th, Mr. Spencer said:

"Everything relating to the business interests of the people has been drawn into the arena of excited popular sentiment and debate. The honesty of fiduciary relations, the accountability of men of great power and great wealth to their fellow men, the regulation and control of so-called trusts and of quasi-public utilities, have received the focussed attention and excited the universal interest of the people. Under the influence of their aroused and determined purpose, some gross abuses have been uncovered. Prompted by these disclosures it is little to be wondered at that the popular judgment has become disturbed and the conclusion hastily and unjustly reached that all important interests merit popular suspicion and distrust."

As the representative of the railroads during the rate regulation controversy, Mr. Spencer relied upon the candid presentation of logical argument to reasoning minds. During the session of the 59th Congress, that passed the Hepburn Bill, there was no railroad lobby at Washington. Although contrary to general rumor and the popular belief, this is the absolute truth. Mr. Spencer insisted not only that there must not be a lobby, but that there must not be the semblance of a lobby.

Mr. Spencer was short in stature, slender, well-knit and amazingly alert in his movements. His fine face and beautiful head indicated his stately lineage, his sturdy honesty, and his great and well balanced intellect. Not only was his mind broad in grasp and keen in penetration, but during the continuously pressing incidents of his ever busy days, it turned with extraordinary rapidity from one subject to another and held the details of each in a marvellous memory. When tasks demanded attention more prolonged than could be taken from the pressure of his office, it was his wont, during the portion of the year passed in New York, to steal away after office hours and go with his secretary to one or another of the hotels—to which one, no one knew save his confidential clerk at his office—and there they not infrequently would work until well into the morning. This great energy was fostered by habits that were moderate to the point of abstemiousness. While under the strain that always marked the hours at his desk, Mr. Spencer once or twice in the morning, and once or twice during the afternoon, would ask for a glass of water; as he drained it fatigue seemed to vanish.

When the writer was asked to prepare this review, he was requested that it be "not merely a tribute, but a discriminating analysis of his virtues and faults." Thereupon, he said to Mr. Spencer's senior secretary: "Now tell me what were Mr. Spencer's faults." That veteran of 30 years in the service of his chief, calmly and deliberately said: "He hadn't any." That is also the statement of the writer, whose own association with Mr. Spencer was close and continuous for a year and a half. In all the relations of life he was clear and clean-cut, punctilious in rendering to every man his due. His keen and direct perception and power of logical and terse expression made him at times impatient of a statement that was long in words and lacking in logic, but this was a virtue, not a fault. Toward the close of a busy day, after he had been battered with letters and telegrams, and callers and board meetings, there sometimes was the display of irritability. This is the very worst that can be said of him; and this is only to say that he was human. To any one who knew the tremendous demands made upon both his body and his mind, the wonder is that the display was not the rule instead of the exception. The trait upon which the men who have been associated with him longest and knew him best especially dilate was his absolute conscientiousness in all things great and small. He did not utter himself, nor permit his subordinates to utter for him, even the fib, the white lie of convenience, but he could parry with the best.

This recountal depicts, without exaggeration, the man whose life was taken on Thanksgiving morning. It is trite to say, that could there have been the foreboding of the disaster in his mind, its most deplorable feature would have been the death of his friends and his servitors that occurred at the same time as his own.

Mr. Spencer was a director in nine railroad and financial corporations; he was active in each board, and held high in the esteem of its members, as evinced by the resolutions they have passed to his memory. He was 59 years old; at the height of his career; without either mental or bodily infirmity; he was never a speculator, leaving a fortune that is but moderate, when his environment and opportunities are considered. His domestic life was of great happiness; his success in rearing a family in no wise being surpassed by his success in business.

LOGAN G. McPHERSON.

The Strike of Railroad Clerks.

The strike of clerks on Southern Pacific lines in Louisiana and Texas was an unusual event in the railroad world. It appears to have failed. The strikers say that it is still unsettled, but the railroad companies claim that the affair is closed so far as they are concerned; that the places of practically all of the striking clerks have been filled with competent men and women, and that the affairs of the different departments and offices which were involved in the strike are running along smoothly.

The American Railway Clerks' Union, to which the strikers belong, is not an altogether new organization, although very little had been heard of it until this disturbance took place. It has been in existence a few years, but is not as yet affiliated with the American Federation of Labor. Because of this fact, it is claimed, the strike did not have the sympathy of other railroad organizations and was to that extent hampered in getting its demands granted. The organization was particularly strong all along the main line of the Southern Pacific, and extended in a lesser degree to the Houston & Texas Central and the Dallas-Sabine branch of the Texas & New Orleans, but these two latter lines were not involved in the strike to any extent. The President of the union is Wilber Braggins, of New Orleans. He is said to have shown good executive qualities in the conduct of the strike but the odds were against him. The positions of many of the clerks require little training or peculiar experience and can be easily filled. The agitation began in Algiers, La., where a large number of clerks are employed in September. The men claimed that they worked regularly ten hours a day and frequently several hours longer than that without extra compensation. The agitation spread to Houston and to New Orleans. A committee of members of the union went to see Mr. Fay, Vice-President and chief executive officer of the Galveston, Harrisburg & San Antonio, but he declined to treat with the committee, telling its members that they must take their alleged grievances to the division superintendents. Failing to get a hearing before what they considered the proper authority, Mr. Braggins issued an ultimatum on October 3. In this ultimatum, eight hours a day for inside clerks, ten hours a day for outside clerks, extra pay for overtime and Sundays, and recognition as a union, were demanded. The railroad officials ignored the ultimatum and on October 5 Mr. Braggins called out the clerks. More than 800 clerks responded to

the call and joined in a strike for the demands set forth in the ultimatum.

All departments of the general offices and division offices and in the offices at terminal points were involved. For two days the railroad experienced difficulty in moving its traffic. This was particularly true at Houston and at several points in Louisiana. As soon as the clerks walked out strenuous efforts were made to fill the vacant places and in many instances young women were employed in clerical positions. Little difficulty was experienced in filling practically all of the vacant positions within a few days.

The strikers were orderly. Crowds gathered at Houston and military protection was about to be extended to the road when the leaders of the strikers gave their word that no unlawful act would be committed; that the men who were out were not anarchists, but were peaceable, law-abiding citizens who were simply striving to obtain by fair means what they considered their just dues. This statement satisfied the railroad officers.

The strike extended from New Orleans to El Paso, with the exception of San Antonio. At the latter place the local union organization was only in tentative form and the members did not feel that the strike order applied to them. Mr. Braggins and other leaders of the union have been persistent in their efforts to negotiate with the railroad, but the union occupies the position of being wholly ignored by those in authority on the Southern Pacific. There are many good men among the strikers, but whether they will be taken back and under what terms are questions that cannot be answered at this time.

The Relationship of the Railroads to the People.*

The American people have recently been passing through a period of intense political agitation and excitement in respect of industrial and commercial conditions. Laying aside the issues which have divided parties for half a century, the public thought and interest have been concentrated on economic agitations. Everything relating to the business interests of the people has been drawn into the arena of excited popular sentiment and debate. The honesty of fiduciary relationships, the accountability of men of great power and great wealth to their fellow men, the regulation and control of so-called trusts, and of quasi public utilities, have received the focused attention and excited the universal interest of the people. Under the influence of their aroused and determined purpose, some gross abuses have been uncovered. Prompted by these disclosures, it is little to be wondered at that the popular judgment has become disturbed and the conclusion hastily and unjustly reached that all important interests merit popular suspicion and distrust.

The railroad manager's position—his relationship to the public, on the one hand, and to the properties he represents and for the successful management of which he is responsible, on the other—has undergone radical changes in recent years. A half century ago the need of the people, and their consequent demand, was for the development of the country through the establishment of transportation facilities. Public sentiment did not merely justify, but, with practical unanimity, demanded the granting not only of charters to railroad companies, but governmental financial aid and encouragement as well. It must be borne in mind that such inducements were at that time needed, for in the uncertainty attending these experimental enterprises, private capital was reluctant to embark in them. Alabama was no exception to this rule of governmental encouragement. Its general statutes and the charters granted by its General Assembly, in response to the sentiments of its people, make a history of public aid and encouragement to the building of railroads, and contain no hint of antagonistic public sentiment or of an ulttimate purpose of severe or drastic public control, or injury.

Under these circumstances, these undertakings, so favored by the state, were, with reason, regarded as private enterprises especially favored by public policy—private enterprises established to provide for a public necessity, it is true, but still private enterprises with right of private control, limited only by the adequate provisions of the common law.

But notwithstanding the public and governmental favor thus extended—notwithstanding the substantial freedom from governmental interference in their management—there were very few railroad enterprises in the South which could at first maintain themselves. The history of many of them was a history of bankruptcy and disaster until the weak and disjointed properties were amalgamated so as to afford continuous transportation, and open the markets of the world to southern products in competition with those of the other sections and of other countries.

With that amalgamation of properties and its consequent public good came great power—exaggerated perhaps in the public mind—but still great power, over the interests of commodities, localities and persons, and with it a demand for public regulation. It must be admitted that this demand, within just and reasonable limits, is based on sound reason. There must be some adequate remedy for the misuse of power affecting great public interests, but important as is the creation of the remedy, no less important are its just and reasonable and wholesome limitations. In the progress of time the public aspect of this question has become entirely reversed. The pendulum has swung from an extreme on the one side to an extreme on the other. As, in the inception of railroad construction, the public relations of the properties were largely lost sight of, so now, in reaction, the public character of the enterprises is almost the only thing recognized or considered, and the private rights of the owners are, in the political thought of the day, almost, if not entirely, forgotten. Justice, however, lies between the two extremes. These properties and their owners should be required to perform faithfully their public duties under reasonable rates and practices, under full publicity without unjust discrimination and without favor for any interests. When this obligation is performed, the residuum is private property entitled to the same consideration and protection at the hands of the public and of the government, as all other private property. In the formation of public policies common justice requires us to remember that when these properties were originally created, it was done in reliance in the good faith of that reasonable public countenance and support under which the public powers were granted, and the private investments were made.

There is no legal obligation on any one to invest his money in railroads or in any other properties. The action of the investor must be voluntary, and inducements of a safe and business-like nature must be presented in order to render the investment attractive. The railroad manager must provide the transportation facilities which the business of the public demands. To accomplish this he must have the necessary money, and, to obtain it, must show successful results in the operation of the property—results which will convince the investor that his investment will be safe and remunerative. Few, if any, railroad companies have an earning capacity sufficient to provide for needed betterments, improvements and additions. All of them are large borrowers. This is especially true at this time of the railroads of the South. Originally constructed under great difficulties and with inadequate means, traversing a country, the traffic requirements of which were at the time small, located in a section practically without large capital of its own, and, by the results of the Civil War and the difference in political conditions, separated for a long period from the sympathies and confidence of investors in other sections, these railroad properties of the South were peculiarly in need of an outside credit as a basis for additional capital to bring them up to modern standards and to provide the additional facilities absolutely essential to accommodate the growing traffic of this section. Investors in southern railroad properties had been alienated by their enormous financial losses, and a restoration of confidence was neither easy nor prompt.

You are all too familiar with the wholesale bankruptcy and financial struggles, and the consequently impoverished condition of the railroads of the South during the 80's and the early 90's for it to be necessary to do more than to recall them to your memories. Happily the difficulties of that particular period, and of those special conditions, have measurably passed away. The South has entered upon a period of increased production in agriculture and in manufactures and of general industrial and commercial activity such as her best friends and most enthusiastic prophets had scarcely dreamed of fifteen years ago.

Fundamentally the basis of this improved condition of the railroad properties is financial credit. With a few minor exceptions substantially all of the enormous improvements to these properties and their equipments, costing hundreds of millions of dollars, in the last decade have been made with borrowed money. The basis of the credit on which the money was borrowed was the increased confidence of the investing public in the substantial growth and the future prosperity of the South, and in the gradually increasing earnings of her railroads.

The most pressing problem with every railroad, and every railroad manager of the South to-day is that of providing additional facilities for the safe, prompt and satisfactory movement of the constantly growing traffic. This has been the case for nearly ten years, but the problem is more pressing to-day than at any previous time.

While it cannot in justice be claimed that the railways have at all times done all that was required by the public, nevertheless, bearing in mind the enormous and sudden growth in southern products and southern commerce for the last ten years, and remembering the conditions of the railroad properties at the beginning of that period, the fact that the products of so marvelous a development have on the whole been successfully moved to market challenges the attentive consideration of those who impartially study the railroad problem.

Let us look for a moment at the conditions under which this task has been and must still be performed.

In a country so wide in extent and with a commerce so vast, it

*From an address delivered before the Alabama Agricultural Association, by Samuel Spencer.

is no longer possible to do the transportation service of the public by individual enterprises or even by small corporations. Large corporations and large aggregations of capital are essential.

This fact and the shortcomings necessarily incident to hurried preparations, and overtaxed facilities, have largely deprived these carriers of popular sympathy, and subjected them to easy misrepresentations and to popular misunderstanding. The outward expression of size and power has impressed the popular mind with the idea that they possessed untold wealth and limitless resources. It made them the easy mark of the political agitator. The result has been that there has crept into the public mind a different standard of justice for them from that which governs the property rights of every individual property holder in the land. Statutes have been enacted establishing principles of liability of a railroad company which do not apply in the case of the farmer, the mill owner or the employer in any other department of industry. Juries have come to think it right to award verdicts for larger damages against railroad corporations than against individual litigants.

With the increased prosperity of the country have come—and properly—higher wages and also higher prices for everything the carrier must buy. Instead of $9 per thousand feet for bridge and shop lumber in 1896, the cost is now $16 to $20, or more; instead of $18 per ton for steel rails, the cost is now $28 to $29; instead of $11,000 each for locomotives, the cost is now from $16,000 to $20,000; instead of $475 for box cars, the cost is now $800, and so on throughout the long list of necessary railroad purchases.

I need not call your attention to the increase in the price of labor. It applies to every industry, and the railroads are not only not exempt, but they suffer the great disadvantage not shared by others, that increased prosperity of the country and activity in business does not bring to them increased prices for the only article they have for sale—transportation.

Increased taxes have also added substantial burdens to the carriers, the taxes of Southern Railway Company, for example, per mile of road having increased, since 1898, more than 40 per cent.

Coupled with these increased expenses there has been a constant reduction in rates, and to-day the percentage contributed by transportation rates to the cost of whatever the people consume is much smaller than ever before in history, and smaller in America than in any other country of the world. And yet the loudest cry that is heard to-day from the public voice, and the most persistent demand from every quarter, is for an enforced reduction in railway charges.

It must be apparent that if there is a continual increase in the units of expenses, with a continual decrease in the units of revenue, the financial strength of the enterprise cannot survive indefinitely. If the process is carried far enough, mere increase in volume of traffic which has sustained the carriers thus far, will not suffice, and without financial strength and credit the carrier cannot adequately meet the proper requirements of the public.

Nothing will avert the public calamity of such conditions except the ultimate conservatism and sense of justice of the American people, and in that ultimate and saving conservatism I still have faith. When their attention is seriously and earnestly directed to the real problem, their conclusion will not only be wise, but will result in the establishment of just and righteous standards for the ascertainment and protection of corporate as well as individual rights.

With industrious effort the impression has been made that the carrier is subject to no restraint in the making of rates, except such as is imposed by statute law, and that it can and does act arbitrarily in fixing the charges for the services which it renders. Nothing could be further from the truth.

The rates charged upon pig iron from Alabama's great iron center were never the rates which the railroads could arbitrarily fix. They, of sheer necessity, were the rates which would enable the iron master at Birmingham to market his product in the northern states, in competition with those of Pittsburg and Chicago, situated in the very heart of the consuming territory, and in Europe in competition with the furnaces of England and Germany, with their cheaper labor and their closer proximity to the purchaser.

Without such rates, fixed as they were and are by competition of markets, Birmingham could never have successfully lighted her furnaces.

The cotton mill industries of the South, which now represent an investment of nearly $250,000,000, and whose products find a market not only in every state of the Union, but in Europe and the Orient, could not have been developed, and become prosperous as they have, if the transportation rates for those products had been arbitrarily made even on the same relative basis as those still charged in New England and in England upon exactly the same articles.

The much greater distance of the southern mills from the large consuming markets had to be overcome and it was overcome largely by relatively lower rates of transportation.

These are two illustrations which you will recognize at once.

The same principle applies in thousands of others, and the result for the entire country is a scale of railroad charges which has challenged the attention of students of economics the world over as being the lowest in existence.

By many the fear is honestly entertained that the question of rates is controlled by the capitalization of the carrier. If this were true, it would follow that a company with a large capitalization would charge high rates, while a company with a small capitalization might charge low rates. The fact is that the rates of all carriers serving the same or competitive sections are, and of necessity must be, in practical accord, for otherwise the company with the lowest rates, if it could escape bankruptcy, would soon absorb all the traffic and drive the others out of the business.

Capitalization can have no practical effect upon the rates charged in this country.

Almost all rates are the result of active and current commercial conditions, arising long after the capitalization of the carrier has been fixed, and which are subject to wide fluctuations, while capitalization often remains unaltered.

Theories have been propounded from many sources, high and low, for the adjustment of rates on a basis of allowing the carrier to earn a fair interest upon the cash investment or upon a fairly ascertained value of the property. Such theories seem fair and equitable and plausible until they are examined. Possibly they might be applied to a single line enjoying a monopoly and serving a section of country the products of which were not in competition with those of any other. When applied to the vast railroad system of this country, comprising 220,000 miles and serving thousands of commercial and industrial centers, each struggling to widen the distribution of its products, such a method of adjustment becomes utterly impracticable. Conceive a simple case at your own doors. Montgomery has three lines to the sea coast at Savannah. You all know that the rates by all must be the same. Is it supposable for an instant that the cost of these several lines was the same, or that their value is the same to-day?

If the rates of transportation should be adjusted by some arbitrary power, so that each should earn only a certain interest upon its cost or ascertained value, would not those rates be different from each other? If they were different, could the line having the higher rate secure any traffic?

If it secured no traffic, what would become of the arbitrary dictum that it should earn the interest on its cost or value?

The interests of the railroad and of its patrons are identical. One cannot prosper without the other. The railroad must do justice to the people. The people should do justice to the railroad. Their cordial co-operation in the great field of human industry is essential to the public welfare. They must work together in a spirit of forbearance and mutual consideration and trust, if they are to accomplish the results for which both are striving, and which are within their grasp if they work together. The man who would sow dissension between them and embarrass their co-operation by misunderstandings, friction and antagonism is a public enemy. While the railroads may be in a sense at his mercy, he should not be tolerated by the people, for the oppression he seeks to bring upon the railroads must reflect itself upon the fortunes of the people long after the disturbing cause has been forgotten.

Many and great problems confront us as a people at the dawn of this new century. Not the least of them is the relationship which should exist between the railroads and the people. It should be approached in a spirit of justice, forbearance and moderation, and with the purpose of establishing a completer understanding and more cordial sympathy between the people and the managers of these public service utilities. It is universally recognized that, in the American Government, the power of the people is irresistible. Upon moderation and wisdom in its exercise depend the safety of life, liberty and property, and the stability of our national institutions.

Foreign Railroad Notes.

The Government of Costa Rica will probably build a bridge over the Barranca river, to replace the structure recently destroyed by a freshet, which was 350 ft. long and 60 ft. high. Francesco Echeverria, General Manager, or Luis Matamoras, Chief Engineer of the Pacific Railway, at San Jose, will furnish information.

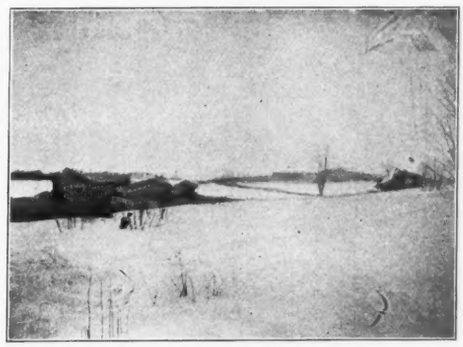
Limited through trains, all sleepers and dining cars, are to run the coming winter as follows: St. Petersburg via Vienna to Nice and Cannes, daily; Berlin through the Brenner Pass and Milan to Cannes, daily; Berlin to Naples, twice a week; Paris to Rennes, three times a week; Berlin and Egypt express, connecting with a fast steamer at Naples, weekly in January and till April, then for two months fortnightly.

The Italian State Railroads beginning with December 1 make a rebate on freights for export shipped to the six chief ports of the peninsula (Genoa, Leghorn, Naples, Brindisi, Ancona and Venice). The reduction is 5 per cent. on goods carried 50 kilometers

(31 miles) or less; 10 per cent. for 50 to 100 kilometers; 15 per cent. for 100 to 150, and 25 per cent. for greater distances.

Repairs to Steel Freight Cars.*

Some early designs of steel cars were gotten up in competition with wooden-car weights which then existed, and the argument that a great ratio of paying load to dead weight was to be had sold a great many cars. As a consequence, many cars were designed that were really too light for the exceptionally heavy service. To-day, however, the weight of the car up to a certain point, is not considered; for instance, 50-ton cars for general service weighed, in 1902, 35,000 lbs.; to-day the same capacity cars weigh 45,000 lbs., or an increase in dead weight of 10,000 lbs. in four years. The questions now are: Will the car stand the severe buffing shocks? Will it keep off the repair track? Railroads now realize that a car continually in service more than pays for the hauling of its dead weight by an increased number of loads. For roads where service is not so heavy, a car with great ratio of paying load to dead weight can be used to advantage.



Wrecked Steel Freight Car.

Wrecked Steel Freight Car.

The first steel cars were built almost entirely of pressed shapes; then other manufacturers designed cars to be built entirely of structural shapes. To-day the builders of so-called "structural cars" use pressed shapes and structural shapes, and pressed shapes are used where, in the mind of the designer, they are most feasible. The days of light construction are over. Where ten years ago an 80,000 lbs. capacity car was considered unusual, the 100,000-lbs. car is now common, and the railroads look for a greater capacity. The time will come when many of us will see trains of cars each unit carrying 150,000 lbs. or over. In fact, to-day this matter is being seriously considered by at least one leading road. True, there are many such cars now, but they are made for special use.

Wrecked Steel Freight Car.

Type of Steel Freight Car Wrecked.

As shown by the records of nine representative car-building companies in the year 1905, there were 224,817 cars ordered; of these 148,493 were steel and 76,324 wood. With steel cars coming so rapidly to the front, the question of repairs is a very live one. In repairing steel cars a road which has none in service usually resorts to the use of skilled labor or returns the cars to the builder; either method is costly, and is apt to prejudice the management's decision when the question of steel vs. wood construction is brought up. There is absolutely no need that any railroad large or small should employ skilled labor or return steel cars to the manufacturer. Skilled labor is not used at shops where cars are built; then why use skilled labor to repair them? When a car is new, naturally the question of appearance and finish is one of the important points of inspection. When a car is out of service the question of utility is uppermost, and repairs should be made in the cheapest manner consistent with good service. Why pay boiler-makers' prices to have a perfectly finished rivet driven, when a laborer at half the pay will drive one that will perform its office satisfactorily in half the time? A little experience with the rough-and-ready car repairer vs. slow skilled labor is usually convincing. Railroads are now using the same repair gangs for both wood and steel cars. If the car foreman lacks the ingenuity or confidence to make the necessary repairs, send him to Altoona, Mt. Clare or Collinwood, where they are past masters in the art. Unless his natural prejudice has overcome his mental balance, the expense of his trip will be repaid many times.

In the early days of repairs to steel cars, it was the custom when a sill was bent to dismember the car and take the piece out to straighten it. Now, an oil furnace or a charcoal fire is put under the car, and when the sill is heated sufficiently it is put back into shape by a pulling jack applied to suit conditions. When sills are broken, a splice can be made by making a butt joint with plates on inside and outside, all securely riveted.

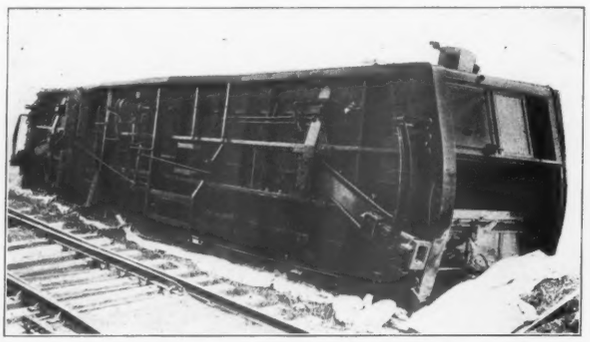
Steel cars received on repair tracks on account of wrecks seldom have any of the frame or body lost, so it is simply a matter of cutting off the bent small parts, straightening them and riveting them in place. It is, however, advisable when purchasing new cars to order a small supply of steel shapes that will most likely be needed for running repairs. This saves time and inconvenience, for no matter what arguments may be put forth about buying shapes, etc., in the open market, when the time comes for such purchase it will be found hard to get immediate delivery, and harder still to shape material for application to cars. On the average road there is not enough demand for repair parts to warrant the expense of putting up a special shop; this condition makes it necessary to look to the builders for material, whether it be of structural or pressed shapes. Pressed members and structural members, such as end and corner posts, stakes, flange angles and plates, can be cut off by hand and heated in a gas or oil fire and straightened on a large flat surface plate or anvil with ordinary blacksmith's tools. One gang of men at this forge can take care of this class of work for a large number of cars. Heating and bending will not injure the steel used in construction of cars, so that practically all the parts removed from a steel car can be utilized either in their original shape or as patches on some other part.

It must be remembered that shocks and treatment that would ordinarily destroy a wooden car merely make the steel car an object that draws the anathemas of the wrecking crew and the solicitous consideration of the repair gang. Gone is the inevitable bonfire that was a simple method of clearing up the debris. The alternative

*A paper read before the New England Railroad Club, Oct. 9, 1906, by J. F. MacEnulty, of the Pressed Steel Car Company, to whom we are indebted for the photographs.

now is either to bury the car or send it to the repair tracks; it won't burn. Heavier and more powerful cranes are necessary, but the right of way is more easily and quickly cleared. When a chain is put around a corner-post or sill, the whole car moves, not merely a section as heretofore. There is a record of steel cars wrecked that could not be repaired. They rolled over a 200-ft. embankment into a swollen river and were carried about two miles from the railroad. It was impracticable to tow them back. Aside from a few similar instances, there is no record of a steel car being wrecked in such a manner that the cost of repairs would make it advisable to scrap it.

The cost of steel car repairs is, on the whole, small by comparison with wooden car repairs, when it is taken into consideration that comparative costs of repairs of the two types as given by railroads are as a rule manifestly unfair. The maintenance reports given for publication are generally taken only for cars that have been repaired. When it is a wood car this means, on an average, slight repairs. But what of the wood cars destroyed? There are thousands of such every month. Should not the cost of renewals, less a scrap credit, be added to the wood-car maintenance sheet to arrive at a fair basis for comparison with the steel cars? This would throw a great balance in favor of the steel car. It, however, would bring forth the argument that many of the wood cars thus destroyed were old and of an obsolete type. While this is true, yet the old car has a money value; a car is a car on the records, and the failure of the old wood cars serves only to enhance the value of the up-to-date steel car that will not disintegrate.



Steel Passenger Car Thrown from Flat Car.

Steel Passenger Car After Being Righted.

These figures are from railroad systems using over 100,000 steel cars, some of them having been in service from seven to eight years. They estimate that the cost of car maintenance is reduced 35 per cent., and stock for repairs 50 per cent. by use of all-steel construction, taking an equal number of cars of both types as a basis.

As regards care of cars, while some roads do not consider it necessary to repaint their steel freight equipment, yet "An ounce of prevention is worth a pound of cure," is here applicable. Any metal surface exposed to the elements is better for a little attention, and on any other structure it would be considered a necessity. At a prominent repair point, where 500 cars a month are repainted, the average cost for gondola or hopper cars, not including the trucks, is as follows:

Sand blasting	$0.45
Paint for body and lettering	6.00
Labor for body and lettering (according to locality)	$1.00 to 2.00

As an illustration of what a steel car will stand, a number of photographs of wrecked 100,000-lb. standard ore cars are shown herewith. These cars, each containing 50 tons of ore, ran three miles down a 4 per cent. grade on the Lake Champlain & Moriah, an ore road in the northeastern part of New York, and with the engine jumped over the end of a switchback, the cars and engine going through the air 422 ft. before striking the ground; the point of contact was frozen ground, the drop being 53 ft. from the track level. The engine and cars then rolled 516 ft. These seven cars originally cost about $1,200 each. The cost of repairs averaged $690 each, which was the manufacturer's cost, and included 10 per cent. profit and an operating and administration expense that on a railroad would be largely taken care of in other operations, and not charged entirely to cars, as is necessary for a car builder. A large part of the cost was in the trucks, owing to the peculiar nature of the wreck. Eliminating the trucks, the repairs to the bodies cost only $350 each. In repairs to trucks alone, it was necessary to replace 17,700 lbs. of steel, 56 journal boxes and lids, 54 brake shoes, 56 journal bearings and wedges, 28 groups of springs, 20 axles, 25 wheels, 1,200 lbs. of forgings and 3,900 lbs. of castings. or a total of 68,800 lbs. of material. A wooden car under similar conditions would have been good only for firewood and a small scrap credit for truss rods, grab irons, etc. This wreck for a small number of cars represents about as severe a condition as could be met, and shows that a steel car is always good enough to be repaired.

There are also shown two photographs which illustrate a steel passenger car that was in an accident. The flat car on which it was loaded jumped the track and overturned, carrying the passenger car with it. The first illustration shows the underframe con-

Wrecked Steel Freight Cars from Wreck on Lake Champlain & Moriah.

The average cost of repairing steel cars varies considerably with the type, and as a larger number of 100,000-lb. steel hoppers have been built than any other class, cost of their repairs would be more interesting. The following is a record of average costs of certain kinds of repairs to this type, not including the trucks:

Cost of Repairing 100,000-Lb. Capacity Steel Hoppers.

One end having side and end sills, draft sills and corner braces and brackets badly bent.	$36.50
Both ends damaged as above and body badly sprung	85.75
To cut entire frame and body apart and re-rivet	*140.00
A steel car having been in a wreck that would totally destroy the body and frame of a wooden car can be repaired as good as new for	50.00
A steel hopper so badly wrecked that scrapping it was considered, was repaired good as new for	160.00

*This is the labor charge of cutting off the bent parts, straightening and re-riveting in place; the only new material used being rivets.

Fig. 1.

Fig. 2.

Fig. 3.

Wrecked Steel Freight Cars from Wreck on Lake Champlain & Moriah.

struction and the corrugated sheets under the monolith floor; the second photograph shows the car after being righted. The only damages sustained were a few broken windows and scratched varnish. A wooden car under similar conditions would have been badly damaged.

Electrification on the Erie.

Westinghouse, Church, Kerr & Co. have been authorized to prepare estimates for the complete electrification of the Rochester division of the Erie Railroad between Rochester and Corning, N. Y. Ninety-five miles electrification of the 34 miles of this division lying between Rochester and Avon and Avon and Mt. Morris was begun last summer and is now nearly finished. The installation is single-phase, similar to that which is being placed on the New York approach of the New Haven road. Power will be supplied from the single sub-station to be located at Avon, N. Y., which is about 19 miles from Rochester and 15 from Mt. Morris. The power is to be derived from the lines of the Niagara, Lockport & Ontario Power Co., which receives the current generated at the new station of the Ontario Power Co. at Niagara Falls, and is now transmitting it at 60,000 volts as far east as Syracuse, where trolley cars of it at 60,000 volts as far east as Syracuse, where trolley cars of the local electric railway system receive it. This long transmission line, which is being constructed in duplicate, crosses the Erie Railroad at Mortimer, about five miles south of Rochester, and from that point the Power company is building a branch line about 14 miles long, which is to supply the sub-station at Avon.

The sub-station building, of brick and reinforced concrete, is now nearly completed, and the electrical apparatus which it is to contain is being shipped from Pittsburg. The equipment of this sub-station is extremely simple, consists of three 750-k.w. transformers of the oil-insulated, water-cooled type, which transforms 60,000-volt three-phase current down to a 11,000-volt single-phase current.

Difficult problems were encountered at Avon and Rochester in supporting the trolley wires over the tracks through the railroad yards, and a new style of overhead span wire construction has been designed to overcome the difficulty of carrying such heavy trolley construction where it is impossible to place poles between tracks. In place of the steel bridges used for this purpose on the New Haven road a system of "Tripartite" steel poles and double spans have been adopted, and is believed by the Erie to be fully as effective a type of construction as the other to meet the conditions; to be far cheaper, and much quicker to erect.

Electric equipment is being placed in six passenger coaches of the interurban type. Three coaches were built by the St. Louis Car Company are 54 ft. long and seat 56 persons. The equipment consists of four 100-h.p. motors and Westinghouse electro-pneumatic control. The cars are designed for a maximum speed of from 45 to 50 miles an hour and will be able to haul one trailer under any of the conditions of service that are likely to prevail. The trolleys are of the Pantagraph type, consisting of a horizontal crossbar, which makes the contact with the overhead wire, and is raised or lowered by a light jointed framework mounted on top of the car, controlled by air pressure, and making sliding instead of rolling contact.

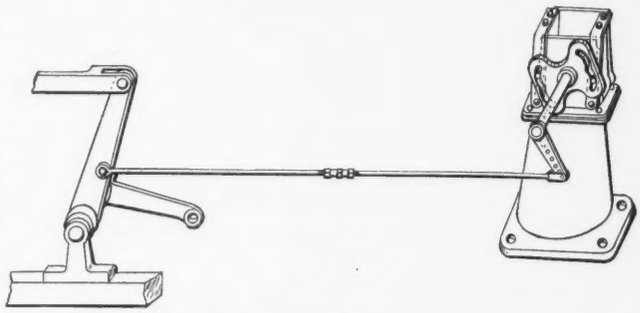
The schedule now being prepared provides for an hourly service in each direction between Rochester and Mt. Morris.

Locomotive Evaporation Tests on the Peré Marquette.

The International Correspondence Schools, Scranton, Pa., have conducted on the Pere Marquette, with the aid of their dynamometer, track and operation-recording car, a series of locomotive evaporation tests to determine the merit of certain fuel saving devices. These devices were three: the Wade-Nicholson hollow arch, a variable exhaust nozzle, and a feed-water heating system. The first of these, the Wade-Nicholson hollow arch, has been described in these columns and is well known to our readers. The other two will be briefly described.

An illustration of the variable nozzle is shown herewith. The variable feature consists of a pair of movable wings on opposite sides of the nozzle, to which an inward-and-outward movement is imparted by a cam pivoted to the side of the nozzle and connected by bell-crank and adjustable rod to the link-lifting arm, or to the reverse lever. The position of the wings and therefore the size of the nozzle opening is thus regulated by the position of the reverse lever, the maximum opening being when the lever is in the "corner," and reduction occurring automatically as the lever is "hooked up." The bell-crank contains a series of holes to enable the connecting rod to be moved up or down, thereby varying the travel of the bell-crank as desired, between limits. The feed-water heating method consisted simply in discharging the air-pump exhaust into the tank. The devices were used jointly in all cases, and no effort was made to determine the proportion of the saving due to each.

In the first three series of tests three locomotives were tested, two freight and one passenger, each locomotive being tested with and without the devices. Two runs were made under each set of conditions, or four for each engine. The fourth series was between two sister passenger engines, one equipped and the other not, one run for each. The dynamometer car and its recording machine enabled a very complete record of the conditions of each run to be kept. A section from the chart of one of the passenger runs with the special equipment, between Detroit and Grand Rapids, is shown, the train having six cars weighing 265 tons. The signification of each of the several lines is marked, evidencing the completeness of the observations. It will be noted that the milepost pen was also used

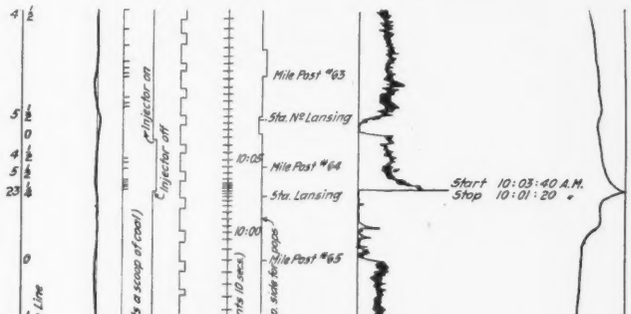


Variable Exhaust Nozzle Used in Pere Marquette Tests.

for keeping record of the occurrence of black smoke and of the opening of the safety valve.

Measurement of the water of condensation from the air pump exhausting into the tank was not attempted, nor any estimate of nor allowance made for same. The effect would be to increase the figures for evaporation per pound of coal, of course, but it was decided to neglect this and thereby insure the conservativeness of the evaporative results. The effect of the introduction of this steam was to produce an average increase in temperature in the feed water of 19 deg., the average temperature with the heater being 84 deg. and without, 65 deg. Account of the quality of the steam was also neglected.

The net gain in evaporation due to the special equipment, based on the equivalent evaporation from and at 212 deg., was 15 per cent. and 14½ per cent. respectively for the two freight engines and 23.3 per cent. for the passenger engine of the first three series. For the



Part of Dynamometer Car Record of Pere Marquette Evaporation Tests.

other passenger engine test the gain was 16.4 per cent. This lower gain, as compared with the first passenger test, is ascribed to the difference in the quality of fuel used on the two engines employed in the test, that for the engine carrying the special equipment being much inferior to that of the unequipped engine, the two runs being made on different divisions on the same day. Rates of combustion varied all the way from 29.6 lbs. of coal per sq. ft. of grate area per hour for one of the freight runs, to 101.9 lbs. for one of the passenger runs.

The tests were conducted under the supervision of Mr. W. L. Kellogg, Master Mechanic of the Pere Marquette. We are indebted to the American Locomotive Equipment Company, Chicago, maker of the Wade-Nicholson hollow arch, for information concerning these tests.

GENERAL NEWS SECTION

NOTES.

Southern roads have announced an advance of 25 cents a ton on pig iron from Birmingham, Ala., to points north of the Ohio river.

A press despatch from Chicago says that 4,000 employees of the Adams Express Company, one-fourth of its total force, have had their pay increased; but the rate of increase is not given.

To meet the complaints of the grain men at Girard Point, Philadelphia, the Pennsylvania Railroad has agreed to allow 1,000 cars to stand on the tracks there [as storehouses] when necessary.

The Supreme Court of Virginia has affirmed the decision of the State Corporation Commission that the law requiring railroads to sell 500-mile tickets at two cents a mile is unconstitutional.

In the United States District Court at Kansas City, December 2, a shipper, pleading guilty, was fined $1,000 for having secured from the St. Louis & San Francisco a secret rate on a shipment of cotton seed meal.

At Greensburg, Pa., the Pullman Company has been fined $50 and costs on each of six indictments for furnishing in its cars adulterated milk, though the court ruled that the adulteration was not done by the company.

The Illinois Tunnel Co., operating the Chicago subways, now carries the United States mails between the general postoffice and all of the principal railroad stations. About 600 trips are made each day, carrying nearly 50,000 bags of mail.

Judge Gray, of Delaware, who was a member of the Anthracite Coal Strike Commission of 1902, has been appointed umpire to settle the questions on which the Southern Railway is at variance with the shopmen of the company who recently struck.

On Monday, November 26, the Interborough Rapid Transit Company of New York, operating the elevated and subway lines in the Boroughs of Manhattan and the Bronx, carried 1,486,777 passengers; a number which is 171,559 larger than any previous record.

Soon after the announcement of an advance in wages on the Pennsylvania, and before the advance took effect, the employees of the road were surprised by an order laying off several hundred shop employees at Altoona and about 100 at the division shops at Verona, on the Allegheny division.

An engineman of the New York Central tells a reporter that the men who are to run electric locomotives on the electric division of that road will receive higher pay than they are now receiving; and that the negotiations on this matter have resulted also in a substantial increase of wages for the men who still run steam locomotives.

In the United States Circuit Court at Louisville, Ky., Nov. 17, the demurrer of the Louisville & Nashville was sustained, thus throwing out of court the suit of the Order of Railroad Telegraphers to enjoin the railroad from forbidding its employees to join the union. Judge Evans holds that Section 10 of the Federal Law of June 1, 1898, is unconstitutional.

Judge Trieber in the United States Circuit Court at Little Rock, Ark., instructing the jury in a suit of a negro woman for damages for being denied a meal on a dining car on the Iron Mountain road, said that, in view of the race feeling, known to exist, the railroad should have set apart separate hours in the dining cars for white passengers and for blacks. A rule assigning the car to whites from 12 to 1:30 and to negroes after 1:30 would be reasonable. The woman was awarded $12.50 damages.

The right of the Florida Railroad Commission to regulate rates on freight within that state has been affirmed by the United States Supreme Court in three cases brought by the Atlantic Coast Line and the Seaboard Air Line. The commission fixed a rate of 1 cent per ton per mile on phosphate, and the roads sought to prevent its enforcement by writ of mandamus. The Florida Supreme Court denied that the commission's rates were unreasonable, and the Supreme Court, finding nothing in the evidence to warrant the reversal of that judgment, has affirmed it.

The Panama Railroad announces that arrangements have been made to accept freight from all carriers to either Colon or Panama, to haul it across the Isthmus and forward it to the ports of destination by the regular carriers beyond, upon repayment of freight equivalent to the proportions which accrue to the Panama Railroad and the on-carrier, from the regular through tariffs as published from time to time. The conditions of the through transit are to be those expressed in the through bills of lading in current use by the regular lines, co-carriers via the Isthmus route.

Evidence was presented to the Interstate Commerce Commission at Denver on December 4 showing that the Denver & Rio Grande had paid rebates to the Utah Fuel Company and the Colorado Fuel & Iron Company, which are both controlled by the Gould interests. The rebates to the Colorado Fuel & Iron Co. have been over $1,000,000 annually. The discrimination was made through preferential rates, which Vice-President Schlacks, of the railroad, is reported to have testified he considered justified on the ground that the fuel companies were part of the Denver & Rio Grande system and as such entitled to the commodity rate customarily granted by railroads for transportation of each others materials and supplies.

The United States Circuit Court at New Orleans has sustained the order of the Interstate Commerce Commission in the case of the Central Yellow Pine Association vs. The Illinois Central and other carriers. On April 15, 1903, the railroads made an advance of 2 cents per 100 lbs. in the rate on yellow pine lumber from points in lumber producing territory east of the Mississippi river in Louisiana, Mississippi and part of Alabama, to Ohio river points. The association, composed of manufacturers and shippers, complained and the commission sustained the complaint, holding the advanced rate unreasonable. The defendants refused to obey the order and the commission brought suit. The defendants have taken an appeal to the Supreme Court.

According to newspaper reports the Southern Railway is to put on two new trains between Washington and Atlanta, running opposite each other, for the purpose of lightening the heavy passenger traffic now carried on the present through trains. It is also said that the present 13 divisions of the system are to be increased to 27, each to have a superintendent, the complete list of appointments to be announced on or before the beginning of the new year. Each of these superintendents will be in absolute control of his division, and it is the purpose to enable each superintendent to get over his entire division at least twice a week. The new trains are to be numbered 43 and 44. The former will carry the mail now hauled by train No. 37 and is to leave Washington at 11 p.m., 15 minutes later than No. 37.

The government has begun another batch of suits against railroads to recover penalties for violation of the Safety Appliance Law. The roads (with the number of violations where 10 or more) are as follows: Allentown Terminal; Ann Arbor; Arizona & New Mexico; Baltimore & Ohio (20); Baltimore & Ohio Southwestern; Central of New Jersey; Chicago & North-Western; Chicago, Milwaukee & St. Paul (32); Cincinnati, Hamilton & Dayton; Cleveland, Cincinnati, Chicago & St. Louis; Detroit & Toledo Shore Line; Duluth, South Shore & Atlantic (11); El Paso & Southwestern; Erie (5); Fort Worth & Denver City; Lake Shore & Michigan Southern; Lehigh & Hudson River; Lehigh Valley; New York, New Haven & Hartford Railroad; Pere Marquette; Philadelphia & Reading; Pittsburg, Cincinnati, Chicago & St. Louis; Toledo & Ohio Central; Wabash.

Government Investigation of Freight Car Situation.

The Interstate Commerce Commission has decided to at once begin an investigation into the question of car shortage throughout the United States. Commissioner Lane says that hearings will be held in the Northwest with relation to shipments of wheat. He calls this the most serious problem which faces the shipping public to-day. There are millions of tons of freight awaiting shipment which the railroads confess themselves unable promptly to handle. In North and South Dakota and Minnesota the elevators along the railroads are full and farmers are stacking their wheat in great bins 20 or 30 feet deep and covering an acre or more of ground. At the same time there is ample room for all of this wheat in the terminal elevators at Chicago, Milwaukee, Minneapolis, Duluth and Superior.

At the recent hearing of the commission in Minneapolis, President Hill, of the Great Northern, laid the responsibility for this on the terminal elevator companies, but these companies came before the commission and showed that they had capacity for over 80 millions of bushels more than they were already using. Many line elevators are closed and bear signs saying, "This elevator is full. We can buy no more grain because we cannot get hauled to market the grain we already have." Mr. Lane further says that the farmers who are unable to sell their grain complain that the railroads are hauling other traffic and preferring it, knowing that they are bound in time to get the hauling of the wheat. Meanwhile, however, the price of wheat will fall and the farmer will be the

sufferer. The commission already has representatives in the Northwest making investigation, but all who have complaint to make are invited to write or telegraph to the commission, giving full particulars.

Speaking of the misuse of cars while away from their owners' roads, Mr. Lane says that the Pennsylvania Railroad declares that approximately 80 per cent. of its cars are not on its own lines. [A more illuminating statement would be that of the percentage on roads not affiliated with the Pennsylvania.] Mr. Lane also hears that loading engines to their full capacity has reduced the average speed of freight shipments from shipper to consignee.

Industrial Development on the Erie.

The industrial department of the Erie Railroad has just issued its annual summary of new industrial establishments on the road. It shows that during the fiscal year ended June 30, 1906, 122 such plants were located on the lines, 79 of them with direct side track connection. Of the total number, 89 are manufacturing plants and 33 grain elevators, wholesale houses, etc. Side tracks have been built to 12 industries not previously reached and extended to 23 industries to take care of increased business. The pamphlet is illustrated with 19 photographs of new manufacturing plants recently built or in course of construction on the road, and contains a detailed list of the new establishments, as well as of a number of plants on which work has been begun since the close of the fiscal year. The pamphlet is issued under the direction of Luis Jackson, Industrial Commissioner, whose successful methods of attracting new industries it well illustrates. Mr. Jackson sums up the past year's development and the industrial policy of the company as follows:

These many industries have been attracted to the territory on account of its merits, or established by local parties. The company endeavors to create conditions favorable to the securing of factories and further development. By effective methods it makes the resources and advantages of its territory thoroughly known in general, while the business organizations and others along the line make it known in particular. Together the organization, co-operation and resultant information are so complete that results are obtained. The company tries to be in immediate touch with the business men along its entire system. Its general, divisional and local officials are so thoroughly alive to the advantages of securing manufacturing plants that prompt and comprehensive action is taken when some project is on foot, or when the company can help engender a movement for the development of latent resources. The company has all its territory districted in relation to resources, advantages and markets, so that it can immediately furnish, to manufacturers of a specific product, current information of a comprehensive nature dealing with the project in its full relation to manufacture and commerce.

Every section of the Erie Railroad has its particular merits. Profitable locations exist. Prompt attention is given to inquiries from manufacturers contemplating new establishments. The information furnished covers matters in relation to resources, traffic, side tracks, and the general data required by them. The constant handling of matters pertaining to the location of various industries and the development of resources gives the company's officials experience. Parties contemplating the establishing of an industry can secure information either by applying to the company's agents, who will take up the matter, or they can write direct to the undersigned. Manufacturers' inquiries as to locations are treated in strict confidence and absolutely reliable information, so as to promote permanent traffic, is furnished.

Conditions on the Northern Pacific.

The *Wall Street Journal* quotes officers of the Northern Pacific as follows in regard to general conditions on that road:

J. M. Hannaford, Second Vice-President in charge of traffic, who has just returned from an extended tour to the coast, says:

"Following heavy snows in November, there came warm Chinook winds, and floods fell on both sides of the Cascades, spreading over the Yakima valley, the Green river canyon and a wide area beyond. The hop fields on the Palouse side were converted into lakes. Traffic has been delayed and we have been put to great inconvenience, but I do not look for much affect on the month's earnings. Agricultural interests will suffer little.

"Northern Pacific is doing the heaviest business in its history. We have more facilities than ever before, but there has been greater investment of every kind by the people along the line, with the result that we cannot handle all the business offered. Our road must be double-tracked, practically from one end to the other, and we must have facilities at terminals in proportion. This will mean a big call on capital. I would not be surprised to see capital hesitate on account of adverse legislation.

"The railroad commissioners are stirring up rate questions all the while. They would do better to devote attention to the matter of facilities. I believe the railroads are doing all they can to move freight and that nothing in the way of legislation could make them do more, but the railroad commissioners could do a lot of good by educating the shipping public. Shippers are not objecting to the rates they pay—rates lower than in any other country, and steadily declining. They are worried about inadequate facilities. And they themselves could eliminate a lot of waste in transportation. One excellent feature of the railroad situation is the elimination or reduction of empty haul, which is the smallest ever seen. Our country is very prosperous, and our railroad is in good shape physically. I think, however, that we should spend more money next year than we did this year, if we can."

A. M. Cleland, General Passenger Agent, says:

"We have had a record fall movement of immigration. Most settlers are Americans and good farmers. We have lost very few people to Canada this year. To show you how our country is settling up, there are 50,000 people scattered along the 200 miles between Glendive and Mandan, supposed to be a semi-arid country, fit only for cattle. I think that we have received 15,000 families this year."

New Tennessee Railroad Commissioners.

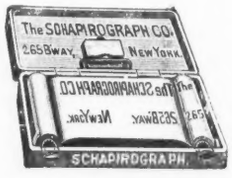
General Harvey H. Hannah and Frank Avent have been appointed members of the Tennessee Railroad Commission, effective January 1. Gen. Hannah is to serve for a full six-year term, succeeding Col. Thomas Williams; Mr. Avent will serve the two years remaining of the unexpired term of Col. J. N. McKenzie, deceased.

Gen. Hannah was born in Louisville, Ky., 38 years ago. He was educated in the Georgia A. and M. College at Dahlonega, Ga., and later studied law in the University of Tennessee, from which he graduated in 1891. After practising at Clinton, Tenn., and at Oliver Springs, he was, in 1893, appointed United States Commissioner. He was a presidential elector on the Democratic ticket in 1896, and in 1897 became private secretary to Gov. R. L. Taylor. At the beginning of the Spanish-American war, Gen. Hannah was made Lieutenant-Colonel of the Fourth Tennessee Volunteer Regiment. His regiment was sent to Cuba and he became Military Governor of the Province of Sancti Spiritus. He returned to Tennessee after his regiment was mustered out and resumed his law practice. In 1900 he ran for Congress on the Democratic ticket but was defeated. In 1903 he was appointed Adjutant General of Tennessee, which office he still holds, having been reappointed in 1905.

Mr. Avent was born in Murfreesboro, Tenn., and graduated from the law department of Cumberland University at Lebanon, Tenn. He practiced law at Murfreesboro and in 1889 represented his county in the lower house of the legislature, refusing two years later the renomination which was unanimously tendered him. In 1899 he was appointed Secretary to the State Railroad Commission, and has held that position ever since.

A New Copying Machine.

The "Schapirograph," made by the Schapirograph Company, New York City, is illustrated herewith. It consists of 5½ yards of paper, coated with a gelatinous composition, stretched between two rollers. Fifty copies can be made from one letter written with copying ink. The surface of the ribbon is dampened with water and the original pressed lightly on it and left for one or two minutes; it is then removed and the copies made on blank paper. The used portion of the ribbon is then rolled up on one roller and after a short time the copying ink soaks in, so that by the time the whole ribbon has been used the process can be repeated without the old ink reprinting.



Course in Reinforced Concrete Design at Columbia University.

In addition to the evening technical courses to be given at Columbia University as announced in our issue of November 23, an evening course in the design of reinforced concrete structures began on December 4. The course includes the analysis of stresses in steel concrete beams and columns; the design of steel floors, foundations, retaining walls, etc., and a study of the characteristics of concrete mixtures. Classes are held Tuesday and Thursday evenings from 7.45 p.m. to 9.45, and will continue for 20 weeks. The fee for the whole course is $15, payable in two instalments.

Train Robberies.

Train robberies, besides becoming frequent, all of a sudden, are richer in details. The Sunday supplements might well give their readers a rest from cosmetics, crazy pictures and articles about the Paleozoic age, and write up these romances and tragedies in real life. A despatch from Topeka last Tuesday says:

A lone robber attempted to hold up a westbound Santa Fe train out of Kansas City last night, after having boarded the train at that place, but was foiled. When he ordered the passengers to hold up their hands, B. E. Wood, a passenger, jumped through a car window. Charles Ward, of Purcell, Ind. T., attacked the robber from behind and grappled with him. The robber turned upon Ward and shot him through the leg, breaking the bone. This happened at a station, and in the confusion following the shot it was thought that the robber had escaped. The train proceeded after a few minutes, when it was found that the man was still on the train, having entered the smoking car at the front end. Suddenly rising from his seat at the front of the car, he ordered the passengers to throw up their hands. The passengers obeyed, with the exception of a cowboy, who showed fight. The robber fired one shot, pulled the bell cord and ran to the front platform. As the train slowed down

he jumped just in time to escape a bullet from the cowboy's gun. Nothing of value was obtained by the robber.

Near Eylan, Texas, on the night of December 1, the express car of a train of the St. Louis Southwestern was robbed by a single robber. He gained entrance to the car unknown to any of the trainmen and assaulted the messenger, throwing him out of the car while the train was moving, and then making his escape. The messenger's injuries are said to be fatal. The newspapers say that the amount of money taken from the safe by the robber was $110,000.

Mississippi Forbidden to Stop Interstate Expresses.

The Supreme Court of the United States, in an opinion by Justice Peckham, December 3, has nullified an order of a state railroad commission to compel trains running from one state to another to stop at designated stations. The case was that of the Mississippi Railroad Commission against the Illinois Central. The commission ordered that certain through trains on that road stop at the town of Magnolia, a place of 1,200 inhabitants, about a hundred miles from New Orleans, and the county seat of Pike County. The contention was made on behalf of the railroad that the town has already three trains daily to New Orleans, and it was urged that to make the through trains stop would disarrange schedules, break connections and prevent compliance with the terms of the road's contract for the expeditious carrying of the mails. The state law was attacked as in contravention of the interstate clause of the Federal Constitution. The Circuit Court of the United States for Mississippi, in which the case was tried, upheld the law, but the Court of Appeals took the opposite view, declaring the exaction unreasonable. That decision is upheld by Justice Peckham's opinion. He held that the railroad offered sufficient facilities to Magnolia without the stoppage of the fast trains.

"Car Hire Agreement."

The following is a list of the more important companies who had, on December 1, signed the agreement to pay each other 50 cents a day for interchanged freight cars (*Railroad Gazette*, Nov. 16). Others will probably enter into the agreement soon.* The lines that have joined own or control 1,353,313 cars.

Atchison, Topeka & Santa Fe.
Baltimore & Ohio.
Baltimore & Ohio Southwestern.
Bessemer & Lake Erie.
Buffalo & Susquehanna.
Buffalo, Rochester & Pittsburg.
Central of New Jersey.
Chesapeake & Ohio.
Chicago & Alton.
Chicago & Eastern Illinois.
Chicago & North-Western.
Chicago, Burlington & Quincy.
Chicago, Indianapolis & Louisville.
Chicago, Milwaukee & St. Paul.
Chicago Rock Island & Pacific.
Detroit, Toledo & Ironton.
Galveston, Harrisburg & San Antonio.
Grand Trunk.
Great Northern.
Hocking Valley.
Illinois Central.
Kansas City, Mexico & Orient.
Kansas City Southern.
Lehigh Valley.
Minn., St. Paul & Sault Ste. Marie.
Missouri, Kansas & Texas.
Missouri Pacific.
Mobile & Ohio.
Nashville, Chattanooga & St. L.
Norfolk & Southern.
Norfolk & Western.
Northern Pacific.
Oregon Railroad & Navigation.
Oregon Short Line.
Pecos Valley System.
Pennsylvania Lines East.
Pennsylvania Lines West.
Pere Marquette.
Philadelphia & Reading.
St. Louis & San Francisco.
St. Louis Southwestern.
San Antonio & Aransas Pass.
Southern Pacific.
Union Pacific.
Vandalia.
Wabash.
Western Maryland.
Wheeling & Lake Erie.
Wisconsin Central.

Electro-Pneumatic Interlocking at Washington.

The Union Switch & Signal Co., Swissvale, Pa., has taken the contract for the interlocking at the new union passenger terminal in Washington, D. C. There will be two machines. The two together will aggregate 210 working levers for the control of 282 signals, 74 single switches and 41 sets of double slip switches with movable point frogs. The signals will be three-position, working in the upper quadrant, and electrically lighted. All high signals will be semi-automatic in their control. No detector bars are to be installed, the switch levers being locked in the machine through the medium of track circuits. Storage batteries will be used exclusively, energizing the track circuits (of which there are 200), as well as the interlockings proper. Elaborate means of communication between the tower director, the train conductors and the gatemen is to be provided, the indications being given by specially designed light signals.

Bolivian Railroads.

A New York syndicate, formed for the purpose of building railroads in Bolivia, has started work on one line. The Bolivia Railway Co., under which name the work is being carried out, is being financed by the National City Bank, New York, Speyer & Co. and W. R. Grace & Co. The lines are to cost $35,000,000. Plans have been made for building 1,000 miles, which will furnish four separate outlets to the seaboard, through Chili, Peru, the Argentine Republic and Brazil. Ten thousand tons of rails, it is said, have been ordered from the United States Steel Corporation, to be used on the Viacha-Ouro line, which is the first to be completed. This line will pass through a rich silver and tin mining section. A line is also to be built from the rubber lands in the Oriente country to Port Pando on the Rio Beni, which empties into the Amazon.

According to the *Brazilian Review* the new administration of the Government will prosecute work on new through lines north and south, also east and west throughout the country. Some of the work is to be carried out by the Ethelberga syndicate, composed of London and French bankers, who financed loans for the Government in 1904 and 1905, and by the Great Western Brazil Railway The latter is already making preliminary surveys between Pesqueria, the terminus of the old Government line, and Tocantins, with the intention of extending ultimately to Arica on the Pacific.

Sale of Cassier's Magazine.

Cassier's Magazine has been sold by the estate of the late Louis Cassier to Mr. Henry Harrison Suplee, for many years the technical editor of the *Engineering Magazine*, and Mr. James Van Vorst Colwell, recently works manager for the C. W. Hunt Company, and the publication will be continued as heretofore by the Cassier Magazine Company at No. 3 West Twenty-ninth street, New York. The editorial conduct of the magazine will be in the hands of Mr. Suplee, who brings to this work a wide experience both in the practice of mechanical engineering and of technical journalism, while the business department will be directed by Mr. Colwell. The first issue of the magazine under the new management will be the January number.

New Buildings at Rensselaer Polytechnic Institute.

The number of students at the Rensselaer Polytechnic Institute, Troy, N. Y., has doubled in the past five years and the school has been enlarged to provide for them. The trustees recently bought ten acres of land adjacent to property owned by the institute and two new fireproof buildings have been built. One was given by Mr. Carnegie and cost about $130,000; the other, a new chemical laboratory, was built by subscriptions from graduates and friends of the school and cost $110,000. The Carnegie building contains, beside recitation and lecture rooms, what is probably the largest drafting room used for educational purposes in the country. It has a clear floor space of 60 x 100 ft. The chemical laboratory building contains a qualitative chemical laboratory covering a space 50 x 80 ft. Much of the equipment for these buildings is new, and new equipment, including a steam turbine, has also been added to the electrical laboratory. Football and baseball fields and tennis courts have been laid out on the new property and a club house is to be built in the spring.

Technical Publicity Association.

The Technical Publicity Association held a meeting on November 22 at the rooms of the Aldine Association, New York, and heard the report of its circulation committee, consisting of H. M. Davis, of the Sprague Electric Co.; C. N. Manfred, of the H. W. Johns-Manville Co., and Paul M. Wade. The committee submitted a plan by which the association will collect information about trade and technical magazines which will be treated confidentially and be used by T. P. A. members only. It is believed that this plan will save time and trouble for magazine publishers as well as the advertisers.

TRADE CATALOGUES.

Friction Draft Gear.—The Frost Railway Supply Co., makers of the Harvey friction draft spring, are sending, to railroad men who ask for it, a pamphlet entitled "The Draft Gear Problem." It consists of a reprint of an address on "Friction Draft Gear on Cars and Locomotives" given by W. O. Thompson before the Central Railway Club last May, and an article on "Functions of a Good Draft Gear" by A. Stucki, reprinted from the *Railroad Gazette* of February 23, 1906. The Frost company have made marginal notes pointing out in what respects the functions spoken of in these articles as being desirable are fulfilled in the Harvey draft gear.

Ideal Power.—The November number of the Chicago Pneumatic Tool Co.'s monthly reprints from contemporaries articles on "The Cost of Leakage in Compressed Air Plants"; "Righting a Tilted Pneumatic Caisson for a Bridge Pier"; "A Handy Kilowatt Table"; "A Magnetic Indicator for Hardening Steel," and "Gas Engines: Relative Efficiency—Cost Data." There are also short articles on the "Little Giant Corner Drill"; "Miniature Air Drill"; "Large Generators for Montreal Light, Heat and Power Co.'s Soulanges Canal Power Station"; "Allis-Chalmers Blowing Engines," and "A Monster Rolling Mill Engine."

The Obermayer Bulletin.—The current number contains as special articles, "The Coke Question in the Foundry"; "Cupola Practice"; "The Right Way to Run a Foundry"; "A New Method of Strengthening Castings"; "How Bill Cooled the Gear," and "Mistakes of Some Foundrymen."

*There is as yet no indication that any of the New York Central lines will join. Other lines conspicuous by their absence are: Atlantic Coast Line; Boston & Maine; Delaware, Lackawanna & Western; Louisville & Nashville; New York, New Haven & Hartford; Seaboard Air Line, and Southern.

Rails and Equipment.—The Walter A. Zelnicker Supply Company, St. Louis, sends a complete list of new rails, relaying rails and rail fittings, as well as locomotives of different gages, many types of cars and other rolling stock which the company offers for sale.

Allis-Chalmers Company.—This company is distributing an index of revised catalogues and bulletins published and about to be published. The index also lists instruction books, leaflets and special publications.

Manufacturing and Business.

The United Engineering & Foundry Co. has allotted to a subsidiary, the Lloyd Booth Co., Youngstown, Ohio, a contract for a blooming mill, rail mill, saws and auxiliary machinery for the Gary Steel Co., Gary, Ind.

The Boston branch of the H. W. Johns-Manville Co. will move, early in December, into a new building at Nos. 55, 57 and 59 High street, Boston. The entire building, seven floors, will be occupied by the offices and sales and shipping rooms of the company.

The American School of Correspondence, Chicago, is erecting a four-story building, 90 ft. x 120 ft., at 58th street and Drexel avenue, within two blocks of the University of Chicago. It will cost $75,000 and is expected to be ready for occupancy June 1, 1907.

Iron and Steel.

The Brooklyn Heights Railroad will soon order from 5,000 to 7,000 tons of rails.

The International & Great Northern has given a contract for 5,000 tons of rails; the Milwaukee & Northern 1,000 tons, and the Delaware & Magnetic 2,000 tons.

The New York Central is giving orders for structural steel for new stations; the company will need 40,000 tons or more. The American Bridge Company booked orders, in November, for 50,000 tons of bridge material and has since taken an order for 5,000 tons for the Philadelphia Rapid Transit.

OBITUARY NOTICES.

George L. Bradbury, formerly Vice-President and General Manager of the Lake Erie & Western, died in Chicago on November 30. Mr. Bradbury was born in Nova Scotia in 1843 and served through the Civil War in a cavalry regiment; he then began railroad work and in 1882 was made General Manager of the Michigan & Ohio, now the Detroit, Toledo & Milwaukee, which is operated by the Lake Shore. In 1886 he was elected Vice-President of the Toledo, St. Louis & Western, and the next year was made Vice-President and General Manager of the Lake Erie & Western. He retired in 1900 when control of the L. E. & W. was acquired by the Lake Shore.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)

Canadian Society of Civil Engineers.

At a meeting of this society in Montreal, November 29, Dr. J. B. Porter lectured on "Mineral Resources, Mines and Furnaces of the Boundary District of British Columbia," with illustrations.

American Society of Civil Engineers.

At a regular meeting of this society December 5 two papers were presented for discussion, one on "The Atchafalaya River: Its Peculiar Physical Characteristics," by J. A. Ockerson, and the other on "The Naval Floating Dock," by Leonard M. Cox. The paper by Mr. Ockerson was printed in the "Proceedings" for September, and Mr. Cox's in "Proceedings" for October.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Atlanta & West Point.—F. A. Healey, Auditor of this road and of the Western of Alabama, has resigned, effective January 1, to go to a traction company at Cincinnati, Ohio.

Cleveland, Cincinnati, Chicago & St. Louis.—See New York Central Lines.

Jamestown, Chautauqua & Lake Erie.—F. L. Chase, President and General Manager, has resigned.

Kansas City Southern.—Edward F. Cost, Second Vice-President and Traffic Manager of the Seaboard Air Line, has been elected Vice-President in charge of traffic of the Kansas City Southern, effective December 15.

Lake Erie & Western.—See New York Central Lines.

Lake Shore & Michigan Southern.—See New York Central Lines.

Michigan Central.—See New York Central Lines.

Missouri, Kansas & Texas.—J. M. Wallace, President of the Central Trust Co., and J. G. Metcalfe have been elected Directors and members of the Executive Committee.

New York Central Lines.—G. J. Grammer, Vice-President in charge of traffic of the lines west of Buffalo, has been elected Vice-President in charge of freight traffic on all New York Central lines, with office at Chicago, Ill. Nathan Guilford, Vice-President in charge of traffic, has resigned on account of ill health. C. F. Daly, Passenger Traffic Manager of the New York Central & Hudson River, has been elected Vice-President in charge of passenger traffic. Ira A. Place, General Counsel of the N. Y. C. & H. R., has been elected Vice-President in charge of the Legal Department. A. H. Harris, General Attorney of the N. Y. C. & H. R., has been elected Vice-President of the Cleveland, Cincinnati, Chicago & St. Louis, the Lake Shore & Michigan Southern, the Michigan Central and the Lake Erie & Western.

Seaboard Air Line.—Alfred Walter, President, has been elected Chairman of the Executive Committee, succeeding James A. Blair.

See Kansas City Southern.

Southern.—W. W. Finley, Second Vice-President, has been elected President, succeeding Samuel Spencer, deceased.

Operating Officers.

Baltimore & Ohio.—C. W. Galloway, Superintendent of the Baltimore division, has been appointed to the new office of Superintendent of Transportation, with office at Baltimore, Md.

Canadian Pacific.—George Spencer, Superintendent of the division from Toronto, Ont., east to Smith's Falls, has been appointed Superintendent at North Bay, Ont., succeeding J. R. Nelson, who takes Mr. Spencer's place at Toronto.

Missouri Pacific.—A. DeBernardi, General Superintendent of the Central division, has been appointed General Superintendent of the Southern division, with office at Little Rock, Ark., succeeding Horace Baker, resigned to go to the Cincinnati, New Orleans & Texas Pacific. W. J. McKee, Superintendent at Sedalia, Mo., succeeds Mr. DeBernardi, with office at Coffeyville, Kan. H. G. Clark, Superintendent at Aurora, Mo., succeeds Mr. McKee. J. W. Daniels, Superintendent at De Soto, Mo., succeeds Mr. Clark. J. Cannon, Superintendent at Coffeyville, Kan., succeeds Mr. Daniels. J. E. Snedeker, trainmaster at Sedalia, Mo., succeeds Mr. Cannon.

Union Pacific.—See Yellowstone Park Railroad.

Yellowstone Park Railroad.—L. S. Sears has been appointed General Superintendent and Traffic Manager of this new road under construction by the Union Pacific.

Traffic Officers.

Canadian Northern Ontario.—William Phillips, general agent of the Canadian Northern, has been appointed General Passenger and Freight Agent of the Canadian Northern Ontario.

Missouri Pacific.—W. D. Hurlbut has been appointed General Freight Agent, with office at St. Louis, Mo.

Engineering and Rolling Stock Officers.

Erie.—R. E. Woodruff has been appointed Division Engineer at Meadville, Pa., succeeding L. P. Baker, transferred to the Mahoning division to succeed W. M. Dawley, assigned to other duties. A. E. Jamieson succeeds Mr. Woodruff as Assistant Engineer at Youngstown, Ohio.

Illinois Central.—D. R. Burbank has been elected Assistant Secretary, succeeding C. H. Wenman, resigned.

Philadelphia & Reading.—F. F. Gaines, Mechanical Engineer, has resigned to go to another company.

Southern.—W. H. Hudson, General Master Mechanic of the Western division, with office at Knoxville, Tenn., has resigned to go into other business. W. S. Murrian, Master Mechanic at Spencer, N. C., succeeds Mr. Hudson.

LOCOMOTIVE BUILDING.

The Cuban Central will shortly be in the market for several locomotives. The contracts will be placed by the Cuba Company, 80 Broadway, New York.

The Lehigh Valley, it is reported, has ordered 50 freight and switching locomotives from the American Locomotive Co. and the Baldwin Locomotive Works.

The Manila Railway Company, which is controlled in the in-

terest of Speyer & Company, New York, is about to place contracts for a number of locomotives.

The Bolivia Railways Company is about to buy some locomotives. The contracts will be placed through W. R. Grace & Company, 1 Hanover Square, New York.

The Missouri Pacific has ordered 25 simple Atlantic (4 4-2) locomotives from the American Locomotive Co., for March, 1907, delivery; and 50 simple consolidation (2-8-0) locomotives, for March, 1907, delivery, and 25 simple six-wheel switching (0-6-0) locomotives, for January, 1907, delivery from the Baldwin Locomotive Works. The specifications are as follows:

Types of locomotive	Atlantic.	Consolidation.
Weight, total	199,600 lbs.	207,000 lbs.
Weight, on drivers	121,600 lbs.	183,500 lbs.
Diameter of drivers	79 in.	63 in.
Cylinders	21 in. x 26 in.	22 in. x 30 in.
Boiler, type	Extended wagon top, radial stayed.	
" wkg. steam press.	200 lbs.	
" number of tubes	362	340
" diameter of tubes	2 in.	
" length of tubes	16 ft. ⅛ in.	15 ft. 6 in.
Firebox, length	97 in.	108 in.
" width	68 in.	66 in.
" grate area	44.5 sq. ft.	50 sq. ft.
Heating surface, total	3,199.0 "	3,264 "
Tank capacity	7,000 gals.	
Coal capacity	14 tons.	

Type of locomotive	Switching
Weight, total	150,000 lbs.
Diameter of drivers	51 in.
Cylinders	20 in. x 26 in.
Boiler, type	Straight top
" working steam pressure	190 lbs.
" number of tubes	274
" material of tubes	National iron
" diameter of tubes	2 in.
" length of tubes	11 ft. 6 in.
Firebox, length	108⅛ "
" width	41⅛ "
" material	Worth steel
" grate area	31.4 sq. ft.
Heating surface, total	1,810 "
Tank capacity	6,000 gals.
Coal capacity	12 tons

Special Equipment.

Air brakes	Westinghouse
Boiler lagging	Magnesia
Brake-beams	Simplex
Couplers (for switching)	Janney
Headlights (for Atlantic)	Pyle-National electric
Injector (for Consolidation and switching)	Hancock
Piston rod packings	United States
Valve rod packings	United States
Sanding devices	Leach
Sight-feed lubricators:	
For Atlantic	Bull's eye
For Consolidation and switching	Nathan's bull's eye
Steam heat equipment (for Atlantic)	Gold

CAR BUILDING.

The Canadian Pacific is in the market for 25 passenger train cars.

The Lehigh Valley is in the market for about 10 passenger coaches.

The Erie, it is reported, may soon be in the market for steel passenger cars.

The Tonopah & Goldfield has ordered 100 gondola cars from the Pullman Company.

The St. Louis & North Arkansas is reported to be in the market for 30 freight cars.

The Chicago Great Western is in the market for 300 box cars of 60,000 lbs. capacity.

The New York Central, it is reported, may soon be in the market for steel passenger cars.

The Indianapolis, Columbus & Southern Traction is reported as in the market for three 60-ft. cars.

The Guayaquil & Quito, Broad Exchange Building, New York City, will soon ask for bids on a number of cars.

The Chilian State Railways Administration has ordered six steel underframe box cars from the Middletown Car Works.

The Pennsylvania has ordered 200 50-ton steel hopper cars, for May and June delivery, from the Middletown Car Works.

The German-American Car Lines will build 300 tank cars of 80,000 lbs. capacity; the tank capacity will be 8,000 gals.

The Chinese Government has ordered 30 steel underframe box and 10 flat cars from the Middletown Car Works for lines in North China.

The Bessemer & Lake Erie has ordered 250 steel hopper cars from the Standard Steel Car Co. in addition to the 250 cars reported in our issue of October 5.

The Philippines Railway, which is being built by J. G. White & Co., New York, has ordered 50 steel underframe platform cars from the Middletown Car Works.

The Cuban Central will shortly be in the market for several passenger and freight cars. Contracts will be placed by the Cuba Company, 80 Broadway, New York.

The Manila Railway Company, which is controlled in the interest of Speyer & Co., New York, is about to place contracts for a number of passenger and freight cars.

The Bolivia Railways Company is about to purchase freight and passenger cars. The contracts will be placed through W. R. Grace & Company, I Hanover Square, New York.

The Northern Ohio Traction & Light Co., Akron, Ohio, has ordered six city passenger and eight or ten semi-convertible interurban cars from the Kuhlman Car Company.

The Indianapolis, Newcastle & Toledo Electric, Indianapolis, Ind., has ordered through the Electrical Installation Co., Chicago, eight interurban cars and two express cars from the Jewett Car Company.

The Wabash is asking bids on 2,000 low side drop end gondola cars of 100,000 lbs. capacity. These cars will be 40 ft. 8¾ in. long and 9 ft. 6¼ in. wide, inside measurements. These cars are in addition to the 4,000 steel hopper and 3,000 box cars reported in our issue of November 16.

The Hocking Valley, as reported in our issue of November 30, has ordered 1,000 steel underframe gondola cars of 100,000 lbs. capacity from the Ralston Steel Car Co. The special equipment includes:

Axles	Block-Pollak
Bolsters	Simplex
Brake-beams	Simplex
Couplers	Tower
Dust guards	American
Journal boxes	McCord
Springs	Railway Steel Spring Co.
Wheels	Griffin

The Trinity & Brazos Valley, as reported in our issue of November 30, has ordered 200 flat cars of 60,000 lbs. capacity from the American Car & Foundry Co. These cars will be 36 ft. 9¾ in. long and 8 ft. 10¼ in. wide, over all. The special equipment includes:

Axles	American Car & Foundry Co.
Bolsters	American style pattern.
Brake-beams	National-Hollow
Brakes	Westinghouse
Brasses	Hewitt
Couplers	Janney
Dust guards	Franklin
Journal boxes	Symington
Springs	Railway Steel-Spring Co.
Trucks	American steel bolster
Wheels	American Car & Foundry Co.

The Grand Rapids & Indiana is asking bids on eight passenger cars for May, 1907, delivery. These cars will weigh 100,000 lbs., and will measure 52 ft. long, 9 ft. 8¾ in. wide and 14 ft. 1¾ in. high, inside measurements. The special equipment includes:

Axles	Pennsylvania R. R. specifications
Bolsters	Pennsylvania R. R. specifications
Brakes	Westinghouse
Brake-beams	Diamond Special
Brasses	Pennsylvania R. R. specifications
Couplers	Buhoup
Curtain fixtures	Forsyth
Curtain material	Pennsylvania R. R. standard
Doors	Pennsylvania R. R. standard
Door fastenings	Pennsylvania R. R. standard
Draft rigging	Westinghouse Friction
Journal boxes	Pennsylvania R. R. standard
Paint	Pennsylvania R. R. standard
Roofs	Pennsylvania R. R. standard
Springs	Pennsylvania R. R. specifications
Trucks	Pennsylvania R. R. standard
Vestibules	Pennsylvania R. R. standard

RAILROAD STRUCTURES.

ATLANTA, GA.—A building permit has been given to the Southern to put up iron freight sheds at Peters and Nelson streets, at a cost of $26,000.

CHATTANOOGA, TENN.—Plans for putting up a new passenger station here have been submitted to the various railroads interested in the project.

DANVILLE, VA.—The Southern Railway passenger station at this place, recently destroyed by fire at a loss of about $25,000, is to be replaced by a new structure.

DENISON, TEX.—Plans for the new union passenger station, which has been under consideration for a number of years, have been submitted to the Texas Railroad Commission for approval. The plans, which were drawn by Henry R. Phelps, of San Antonio, Tex., call for a station building to cost $130,000. With sheds and rearrangement of tracks the total cost is to be about $250,000.

MACKEY'S FERRY, N. C.—The Norfolk & Southern has applied for permission to alter its plans for the proposed drawbridge, which is to be built over Albemarle Sound. The structure is to have two openings each 140 ft. wide instead of 70 ft. as originally planned.

MESABE, MINN.—The Duluth & Iron Range is putting up a new passenger station 62 ft. x 30 ft. at this place.

NEW HAVEN, CONN.—It is officially announced that the New York, New Haven & Hartford will build its new passenger station on the land which it owns at the "Farm," which is southwest of the present station. The cost of the proposed structure will be approximately $600,000.

NEW YORK, N. Y.—Plans for the terminal buildings now under construction for the New York & New Jersey Railroad (tunnels) have been made public by President William J. McAdoo. There are to be two buildings in Church street, one from Cortlandt to Dey street, and the other from Dey to Fulton street. One is to be known as the Fulton, and the latter as the Cortlandt. Each is to be 22 stories high above the surface, and 75 ft. below the street line.

Work will be started at once on a new power house for the New York, Westchester & Boston. It will cost $500,000. The structure is to be built on the sound shore, north of Pelham Bay Park.

PITTSBURG, PA.—Plans have been approved for the enlargement of the passenger station of the Pittsburg & Lake Erie. They provide for enlarging the left wing of the present structure, increasing the capacity about one-fourth. Contracts for steel to be used have been let to the American Bridge Co., and other contracts will shortly be let.

PRINCE RUPERT, B. C.—Plans are being made by Architect F. M. Rattenbury, for the Grand Trunk Pacific, for a hotel to be built at this place, the proposed western terminus of the road, to cost $40,000.

SCRANTON, PA.—Revised plans have been made by the Delaware, Lackawanna & Western for a new station to be put up at Platt Place. The building is to be four stories high, and will hold the offices of all the Scranton officers of the road. The present freight house is to be replaced by a new structure. Plans are being prepared for building large machine shops near South Washington avenue and Mattes street.

TRINIDAD, N. MEX.—The Atchison, Topeka & Santa Fe, it is said, will spend $60,000 for improvements to its yards at this place. The present freight house is to be moved to a new location and two stories are to be added. Additional tracks will be laid in the yard.

VANCOUVER, B. C.—C. E. Bell, Civil Engineer, appointed by the government to estimate the cost of bridging the narrows with a bridge to connect the mainland with Vancouver Islands, has submitted his report. It calls for an expenditure of $25,500,000. The plan includes seven bridges varying in length from 700 to 1,500 ft. each, in addition to a span of 2,800 ft. over the narrows.

VICTORIA, B. C.—An officer of the Canadian Pacific writes that the appropriation of $132,000 is to be divided to pay for the cost of making fills, putting in concrete arches and replacing temporary wooden structures with steel spans on the Esquimault & Nanaimo. Contracts have already been let for four half-deck plate girder bridges each 40 ft. long.

WILKESBARRE, PA.—An agreement, it is said, has been reached between the city officials and the Lehigh Valley, the Pennsylvania, the Central of New Jersey and the Delaware & Hudson railroads to abolish grade crossings at many of the principal streets of this city.

WINNIPEG, MAN.—The Canadian Northern and the Grand Trunk Pacific, it is said, have reached an agreement to have the former build its terminals here at an approximate cost of $3,500,000. The Grand Trunk Pacific is to pay a yearly rental of $65,000 for the use of a part of the terminals and for trackage rights into the city.

Bids have been received by the City Council for building the Redwood bridge over the Red river as follows: Dominion Bridge Co., $88,800; Algoma Steel Bridge Co., $92,000; Ontario Bridge Co., $97,200; Heenan & Froanda, of Manchester, England, $192,144, and William Jackson, $278,000.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALBERTA RAILWAY & IRRIGATION CO.—Application, it is said, will be made by this company for incorporation under the name of the Crawford Bay & St. Mary's, to build a line from the terminus at Lethbridge, Alb., east to Pakowki Lake, thence east through Alberta and Saskatchewan.

ATLANTIC COAST LINE.—Work has been started by this company at Waycross, Ga., on its new freight yards. The new yards will extend about a mile beyond the present yards, and contain 15 miles of tracks. The Pennsylvania Bridge Co., which is building the shops for the company at this place, has the contract for the yard work, and is already laying tracks. One of the shop buildings, it is said, will cover four acres of ground, and is to be of brick, three stories high.

BIRMINGHAM SOUTHERN.—The Tennessee Coal, Iron & Railway Company is reported to have given a contract for construction of a five-mile extension of this road so as to reach new mine territory near Pratt City, Alabama.

BROXTON AIR LINE.—Application is to be made in Georgia for incorporation, by a company under this name, to build a line from Broxton north via McRae to Helena, approximately 30 miles. W. R. Frier, E. S. Cotton, E. H. Moore and T. M. Cheatham, all of Broxton, are interested. The work includes building a drawbridge over the Ocmulgee river.

CALIFORNIA ROADS.—Plans are about ready and final surveys made by the Mammoth Copper Co., of Kennet, Cal., to build a four-mile narrow gage line from the Quarter Hill Mine to the central spur. The work will include a long bridge over the Sacramento River.

CANADIAN PACIFIC.—Trains on the new Boston and Wolseley branch, which is to be 122 miles long, were put in operation November 24 as far as Windthorst, 98 miles from the Reston end. The rest of the line is to be finished next spring. The Moose Jaw line north has also been put in operation as far as Tuxford, and the Lauder extension, which has been completed as far as Broom Hill, 16 miles. Track-laying is being pushed on the Winnipeg Beach line, and has been also started at Strassburg, on the North Pheasant Hills extension. Work on the double-tracking of the main line east of Winnipeg will be carried on all winter. About 60 per cent. of the grading on the new branches has been completed.

CANADIAN ROADS.—Hood Bros., of Spokane, Wash., owning timber lands near Crazy Creek, B. C., are said to be planning to build a line three miles long from their property to the main line of the Canadian Pacific.

CANADIAN SOUTHERN & NEW YORK.—Incorporated in Oklahoma with $1,000,000 capital by G. V. Pattison, H. W. Pentecost, L. E. Pentecost, H. L. Pattison and N. D. McGinley, all of Guthrie, Okla. The company proposes to build a line from Salisbury, New Brunswick, southwest to St. John. Both these points are reached by the Intercolonial, and such a line will parallel that road.

CHICAGO, BURLINGTON & QUINCY.—Official confirmation has been given to the report that this company will spend several thousand dollars for increasing its freight facilities in St. Joseph, Mo. Plans for the improvements are being made, and it is expected that the work will be started early next spring.

CHICAGO, MILWAUKEE & ST. PAUL.—Contracts are reported let to Nelson Bennett, of Spokane, Wash., to pierce a tunnel 8,750 ft. long through the Bitter Root mountain range between the states of Montana and Idaho. Contracts have also been let to the same man for grading both east and west of the tunnel in Montana and Idaho, averaging about 100,000 cubic yards to the mile, nearly all of which is solid rock. The work includes a number of small tunnels and much trestle work.

CLEVELAND, BROOKLYN & ELYRIA (ELECTRIC).—Rights of way, it is said, have been secured by this company for building its proposed electric line from Cleveland, Ohio, southwest to Elyria. Bids for the work are to be asked for shortly. The proposed route is via Strongsville, Vigil, Columbia, and North Eaton to Elyria. All the preliminary engineering work has been completed, and negotiations are pending for some of the necessary franchises. The company is incorporated for $100,000 capital, with officers as follows: J. J. Breitenger, president; B. E. Ottman, treasurer, and J. H. Knieseley, Jr., secretary.

COVINGTON & SOUTHWESTERN.—At a recent meeting of this company in Covington, Ind., W. G. Ruhl was elected President; H. M. Campbell, Vice-President and Treasurer, and C. W. Winkler, Secretary. The company proposes to build a line from Covington southeast to Kingman, thence east via Wallace, Alamo and Yountsville to Crawfordsville, about 40 miles. The project has been financed and contracts for the work will be let shortly. Grading work has been completed from Covington to Coal Creek, eight miles, and it is expected to have this section in operation to the coal fields south of Covington this winter.

CRAWFORD BAY & ST. MARY'S.—See Alberta Railway & Irrigation Co.

CRYSTAL RIVER & SAN JUAN.—An officer writes that this company has built eight miles of road from Placita, Colo., to Marble. The company is planning to extend the road next year from the latter place to marble quarries, an additional three miles. The work includes a trestle 350 ft. long over the Crystal River. C. A. Meek, of Marble, Colo., is President. (Nov. 16, p. 136.)

DENVER & RIO GRANDE.—Two important projects, it is said, are being considered—the construction of a connection with the Denver, Northwestern & Pacific and the broad-gaging of the line between Salida and Montrose. For some time the Denver & Rio Grande has been planning to shorten the distance from Denver to Salt Lake City. The plan under consideration, it is said, is to make

joint arrangements with the D., N. W. & P. to build from Dotsero, on the Rio Grande, to Kremmling, on that road, following the Grand river. The work of changing the Rio Grande across Marshall Pass from narrow to standard gage may soon be started. The line has been made standard between Grand Junction and Montrose, leaving a gap to be broad-gaged from Salida to Montrose, 136 miles. With the completion of this, the Rio Grande would have two standard-gage roads from Denver to Grand Junction.

ERIE.—The electrification of 30 miles of the Rochester division of this road is to be completed by the first of next year. The company, it is said, has decided to electrify the remaining 70 miles of this division, to Corning and the branch to Dansville. From the latter place it is proposed to extend the line towards Hunts on the Buffalo division.

GEORGIA, FLORIDA & ALABAMA.—Contracts are reported let for work on this road. The first section will begin at the crossing of the Central Railroad and run to the terminal, for which a site was recently bought by the company on College Hill, in Cuthbert, Ga. A line will also be built from the terminal at Depot street to the freight house at that point. On the completion of this work an extension of the road from Cuthbert north to a connection with the Seaboard Air Line will be built.

GILA VALLEY, GLOBE & NORTHERN.—See Southern Pacific.

GRAND TRUNK PACIFIC.—This company has submitted detailed plans to the Railway Commission for its proposed route through the Yellowhead Pass. The plans show that the line over the summit of the Rocky Mountains at this point will have a maximum grade of about 4/10 per cent., and it is expected that this will be the heaviest grade on the entire line to the Pacific Coast. The work will necessitate some heavy cuts and fills.

The Transcontinental Railroad Commission, it is said, will at once ask for bids for building from La Toque west to Lake Superior Junction.

GULFPORT & NORTHWESTERN.—An officer writes that surveys are being made by this company for building its proposed road from Gulfport, Miss., northwest to Poplarville, about 45 miles. As soon as surveys are completed, construction will be started. (Nov. 30, p. 153.)

HARRISBURG & OHIO RIVER.—D. E. Baxter & Co., Inc., New York, tell us they have contracts for constructing this proposed line from Galatia, Ill., on the Illinois Central southeast to Harrisburg, on the Cleveland, Cincinnati, Chicago & St. Louis. It has been fully financed and work will begin December the 3d. T. Edwin Bell, of Hammond, Ind., is President, and C. W. Ferguson, of Harrisburg, Ill., Secretary. (See Construction Record.)

ILWACO RAILWAY & NAVIGATION CO.—See Oregon Railroad & Navigation Company.

LAKE SUPERIOR SOUTHERN.—D. E. Baxter & Co., Inc., New York, tell us they have contracts for the construction and equipment of this proposed line from Madison, Wis., north to Huron Bay, Mich., 290 miles. M. C. Phillips, President; W. K. Rideout, Secretary and Treasurer; E. B. Priest, Chief Engineer, Oshkosh, Wis. (Oct. 26, p. 115.)

LAS VEGAS & TONOPAH.—This company has filed an amendment to its charter in Utah, which permits the company in addition to its main line now building from Las Vegas to Tonopah in Nevada, to build a number of extensions into any county in Nevada or California. The purpose of the company is to at once build a branch into the Greenwater mining district of Inyo County, Cal.

LORAIN & ASHLAND.—This road, which is practically completed from Lorain to Wellington and surveyed south to Ashland, is said to be now making arrangements to extend south to the Ohio River. It is also said that plans are being made to extend the road into Pennsylvania next year.

LOUISVILLE, NEW ALBANY & CORYDON.—At a recent meeting of the stockholders of this company, which operates a steam railroad from Corydon, Ind., north to Corydon Junction, eight miles, where connection is made with the Southern, an extension was authorized to be built east via Lanesville to New Albany, about 20 miles. The new line is to be operated by electricity. Surveys are now being made and work is soon to be started.

MADRAS & EASTERN.—An officer writes that this company was incorporated in Oregon to build a line from Madras, Oregon, east to Hay Creek Coal Mines, and thence through the yellow pine timber belt towards Port Ontario. Contracts for the work, which will not be difficult, are to be let next year. Both steam and electricity are to be used as motive power. W. H. Huston, of Prineville, is President. (Nov. 16, p. 137.)

NEW YORK, WESTCHESTER & BOSTON.—The Common Council of New Rochelle, N. Y., has granted a franchise to this company to build its proposed line across various streets in that city either by overhead structures or underground passages. Two routes are at the option of the company, one of which must be selected within three months.

NEW YORK CITY SUBWAYS.—The Rapid Transit Commission and the Board of Estimate and Apportionment have decided to prepare forms for bids to be advertised for the three proposed new rapid transit subway lines in Manhattan, together with two new lines in the Bronx and the line to Fort Hamilton and Coney Island in Brooklyn. There will be three classes of contracts advertised early next year. One will call for bids for construction only, another will call for operation only and the third will be for construction and operation. The proposed lines in Manhattan are the Third, Lexington, Seventh and Eighth avenues.

OREGON RAILROAD & NAVIGATION CO.—An officer of the Ilwaco Railway & Navigation Co. writes that the proposed extension of this road is east along the Washington side of Columbia river, 17 miles from the present southern terminus at Ilwaco, Wash., via Chinook, Fort Columbia, Point Ellice and Hungry Harbor to Knappton. Contracts for about 14 miles from Ilwaco to Cook Station have been let to Erickson & Peterson, of Portland, Oregon. The work will be light. (Nov. 16, p. 137.)

PENNSYLVANIA.—Most of the work in the Pittsburg district in connection with the terminals of this company at the Point has been completed, and the large warehouse on Duquesne way, opposite the Pittsburg Exposition building, has been opened for service. Robert S. Spencer, of Baltimore, has been appointed general superintendent of the Duquesne Warehouse Company, which was formed to operate the Point terminals. This is a very large freight terminal and was built at a cost of more than $3,000,000.

PEORIA & CANTON (ELECTRIC).—Under this name a company has been incorporated in Illinois by the McKinley Syndicate, with a capital of $25,000. Preliminary surveys are being made for a line to connect with the McKinley system, over routes not yet determined upon. The incorporators include C. Zilly, C. R. Little and others. The directors are W. M. McKinley, R. H. Watson, S. L. Nelson, General Manager of the Peoria Railway, and others.

PERTH AMBOY & STATEN ISLAND (ELECTRIC).—Application has been made in New Jersey for incorporation by a company under this name, with a capital of $175,000, by F. W. Schnitz, E. White, M. F. Reiff and H. Lowerself, of New York; E. Biesenbach, of Newark, and J. W. Humphreys, of New York. The office of the company is at New Brunswick, N. J. The new corporation proposes to build an electric line from Richmond, S. I., to Tottenville, and operate ferry service between that place and Perth Amboy, at which place negotiations are under way for water front property. Frederick Griffen and W. J. Lally, of New York, are carrying out the preliminary work.

PITTSBURG RAILROAD.—A number of Boston capitalists, it is said, have been given a charter in Massachusetts to build a belt road around Pittsburg, Pa., also a terminal in that city at a cost of $20,000,000. The directors, whose names are not given, are said to be securing the necessary franchises to carry out the work.

ST. LEON.—Under this name a company with office at Louisville, Que., is asking for incorporation to build a line from St. Leon, Que., north to St. Elie, about 20 miles, with a branch east to Three Rivers; also one west to Lake Maskinonge, aggregating 40 miles additional.

SAN PEDRO, LOS ANGELES & SALT LAKE.—This company has filed with the Federal land office at Salt Lake, Utah, a map of its surveys for a proposed branch line into the Deep Creek mining region in the western part of Utah. The proposed route is from a point on the main line near Tintic Junction west, passing near Fish Springs, to Deep Creek, about 115 miles. This new line is eventually to be extended southwest to Ely, Nev., an additional 60 miles.

SOUTHERN.—Announcement is made that this company has given contracts to the W. J. Oliver Co., of Knoxville, Tenn., for laying a second track from Charlotte, N. C., to Atlanta, Ga., 260 miles. The contract calls for the beginning of the work by the first of next year, and its completion within five years. The line is also to be straightened and the grades reduced.

SOUTHERN PACIFIC.—According to reports from Clifton, Ariz., this company has decided to build an extension of the Gila Valley, Globe & Northern east to that place and Morenci.

YELLOWSTONE PARK.—This company, which was incorporated in 1905 to build a line from the Northern Pacific at Bridger, Mont., has completed the Bear Creek division, and it is now in operation. It extends from Bridger, Mont., where connection is made with the Northern Pacific, southwest via Jennings, Golden Belfry, Bear Creek, Smith and McCarthy, to Amalgamated, 26 miles. F. E. Hall, Belfry, Mont., is President. This line has no connection with the company incorporated by the Union Pacific under the same name. (See Construction Record.)

RAILROAD CORPORATION NEWS.

Atchison, Topeka & Santa Fe.—A meeting of the stockholders has been called for January 30 to authorize an issue of about $25,000,000 additional capital stock. There is now outstanding $101,955,500 of an authorized issue of $152,000,000. After this meeting the Board of Directors will decide whether to issue new stock direct to the stockholders or to issue an equal amount of convertible bonds. The proceeds are to be used for buying additional equipment and branch lines and to pay for a connection from Texico, N. Mex., south to the Gulf, Colorado & Santa Fe, probably at Brownwood, Texas.

Gross earnings for the month of October, 1906, were $8,462,883, an increase of $1,433,426; net earnings $3,692,611, an increase of $807,126.

Atlanta & Charlotte Air Line.—This company, which is operated by the Southern, has arranged with J. P. Morgan & Co. to extend to January, 1910, the following securities, which were to mature January 1, 1907: $500,000 outstanding preference mortgage bonds (originally 7 per cent. but extended from 1897 at 4 per cent); $4,250,000 first mortgage 7 per cent. bonds, and $750,000 non-cumulative income bonds (extended at 4 per cent. from 1900). All the bonds are to draw interest hereafter at the rate of 4½ per cent. a year, and the holders who deposit their bonds for extension on or before January 2, 1907, are to be given three-quarters of 1 per cent. in cash, and are to surrender their voting power of 10 votes on each $1,000 first mortgage bond.

Canadian Northern.—It is reported that interests identified with this company have bought control of the Quebec & Lake St. John, which has $4,303,500 outstanding capital stock; it runs from Quebec to Roberval, Que., 189 miles, and from Chambord to Chicoutimi, Que., 51 miles. The dock and terminal properties of the company at Quebec and Chicoutimi would be valuable to the Canadian Northern.

Central of Georgia.—The New York Stock Exchange has listed an additional $1,000,000 consolidated mortgage 5 per cent. bonds of 1945 of this company, being part of an authorized issue of $18,500,000. The additional securities were issued to reimburse the company in whole or in part for land bought at Savannah, Albany and other places in Georgia and Alabama; for additional yards and terminals; for making standard gage the 50-mile narrow gage Columbus & Rome Railroad, which runs from Columbus, Ga., to Greenville; for new equipment, and for new shops and shop improvements.

Chesapeake & Ohio.—See Pennsylvania.

Cleveland & Sharon Electric.—This company has been incorporated in Ohio with $2,500,000 capital stock as the successor to the Cleveland & Sharon Traction, which has been in the hands of a receiver since September, 1904.

Cleveland & Sharon Traction Co.—See Cleveland & Sharon Electric.

Consolidated Railway (N. Y., N. H. & H. Electric Lines).—It is reported that this company has bought the Rhode Island Securities Company, which has outstanding $12,000,000 capital stock, and $5,000,000 bonds. It controls the street railway companies, gas and electric light properties in and near Providence, R. I.

Delaware, Lackawanna & Western.—An extra dividend of 10 per cent. has been declared on the $26,000,000 outstanding stock payable December 20 to holders of record on December 5. Since April, 1905, the dividend rate has been 10 per cent. per year, before which, since 1886, it was 7 per cent. Extra dividends of 10 per cent. were paid in 1904 and 1905.

Erie.—Gross earnings for October. 1906, were $4,877,066, an increase of $464,437; net earnings, after taxes, $1,594,375, an increase of $317,649.

Interoceanic of Mexico.—Dividends have been declared as follows: Two and one-quarter per cent. on the $5,750,000 outstanding 4½ per cent. second debenture stock, on which 2¼ per cent. was paid last May; 7 per cent. on the $2,347,295 outstanding 7 per cent. "B" debenture stock. The directors have decided to recommend a dividend of 2 per cent. on the $5,000,000 outstanding 7 per cent. preferred shares, after providing for the payment of $73,230 back dividends on this stock. In 1905, 4½ per cent. was paid on the "B" debenture stock, and in 1904, 6 per cent. The National of Mexico owns $5,000,000 of the second debenture stock. The road runs from Vera Cruz to Mexico City, 342 miles, and also operates 394 miles of branches. Gross earnings for the year ended June 30, 1906, were $3,230,165, an increase of $187,112; the operating expenses decreased $90,639, leaving net earnings of $942,924, an increase of $277,750.

Lake Shore & Michigan Southern.—A semi-annual dividend of 6 per cent. has been declared on the $49,466,000 outstanding capital stock, of which all but $4,177,000 is owned by the New York Central & Hudson River. Previous annual dividends have been: 1898, 6½ per cent.; 1899 to 1903, inclusive, 7 per cent.; 1904 and 1905, 8 per cent.

Gross earnings, partly estimated, for the six months ending December 31, 1906, are $21,843,800, an increase of $1,410,000; net earnings $4,855,200, an increase of $1,908,000. Gross earnings for the year ending December 31, 1906, are $42,450,900, an increase of $3,850,100; net earnings $9,051,200, an increase of $1,781,900. The net income is $5,511,200, an increase of $1,043,200, and the surplus after the 10 per cent. dividend is $564,600, an increase of $53,900.

Louisville & Nashville.—Gross earnings for October, 1906, were $4,139,835, an increase of $560,063; net earnings $1,176,247, an increase of $118,799.

Michigan Central.—A semi-annual dividend of 3 per cent. has been declared on the $18,738,000 outstanding capital stock. The annual rate has been 4 per cent. since 1895; 5½ per cent. was paid from 1892 to 1894, inclusive, and 5 per cent. in 1890 and 1891. The New York Central & Hudson River holds $16,814,300 of the capital stock.

Gross earnings, partly estimated, for the six months ending December 31, 1906, are $13,468,000, an increase of $911,300; net earnings $2,281,100, a decrease of $25,800. The estimated gross earnings for the year ending December 31, 1906, are $26,087,100, an increase of $2,803,200; net earnings $4,566,300, an increase of $148,300. The net income is $987,100, an increase of $13,600, so that the increased dividend leaves a surplus of $50,200, a decrease of $173,800.

National of Mexico.—See Interoceanic of Mexico.

New Orleans & North-eastern.—A dividend of 5 per cent. has been declared on the $6,000,000 outstanding capital stock, payable December 1 to holders of record November 30. In 1905, 3½ per cent. was paid, and in 1903 and 1904, 3 per cent.

New York Central & Hudson River.—A quarterly dividend of 1½ per cent. was declared, on December 5, on the $149,442,500 outstanding capital stock. The annual dividend rate has been 5 per cent. since 1900, and for four years before that time it was 4 per cent. The gross earnings, partly estimated, for the quarter ending December 31, 1906, are $24,736,900, an increase of $1,218,700; net earnings $6,124,200, a decrease of $130,000. The partly estimated gross earnings for the year ending December 31, 1906, are $92,399,100, an increase of $6,303,500; net earnings $25,716,400, an increase of $1,121,600. The net income increased $2,292,600, a large part of this being on account of the increased dividends paid on the Michigan Central and the Lake Shore & Michigan Southern stock held by the New York Central. The surplus after dividends (5¼ per cent. for the year) is $3,185,500, an increase of $1,072,200.

A dividend of 5 per cent. has been declared, payable December 31, on the $1,615,000 capital stock of the St. Lawrence & Adirondack, being the first dividend since July, 1903, when 3 per cent. was paid. The New York Central owns the entire capital stock of the St. L. & A., and operates it as that part of its Adirondack division running between Malone Junction, N. Y., and Valleyfield, Que., 30 miles.

See Michigan Central; also Lake Shore & Michigan Southern.

New York, New Haven & Hartford.—The United States Supreme Court recently decided that it was constitutional for a railroad company in Connecticut to condemn the outstanding shares of a corporation, three-quarters of the stock of which it owned. The case was that of the N. Y., N. H. & H. vs. a holder of two shares of the New Haven & Derby, the N. Y., N. H. & H. owning the rest of the stock.

Pennsylvania.—This company and its subsidiary companies have sold to Kuhn, Loeb & Company all of their holdings (156,300 shares) of Chesapeake & Ohio stock. The market value of this stock is about 60. There is outstanding $62,799,100 C. & O. capital stock.

Philadelphia & Reading.—Gross earnings for October, 1906, were $3,828,428, an increase of $139,091; net earnings, $1,556,900, a decrease of $56,758.

Quebec & Lake St. John.—See Canadian Northern.

St. Lawrence & Adirondack.—See New York Central & Hudson River.

Rhode Island Securities Company.—See Consolidated Railway.

Southern.—See Atlanta & Charlotte Air Line.

Wiscasset, Waterville & Farmington.—This narrow gage road, which runs from Wiscasset, Me., to Albion, 42 miles, and has been in the hands of a receiver since October 7, 1905, has been sold under foreclosure to Carson C. Peck, of New York, for $93,000.